THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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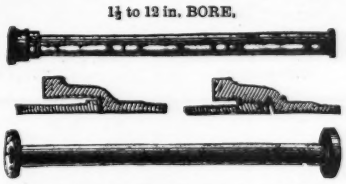

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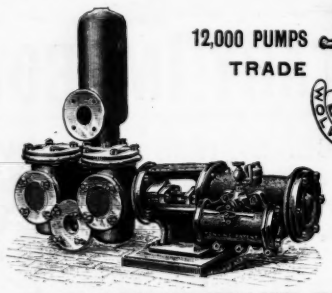
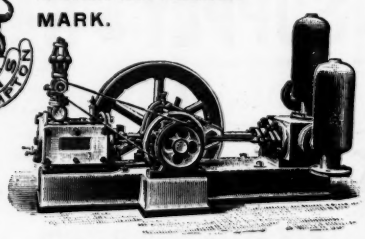


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.



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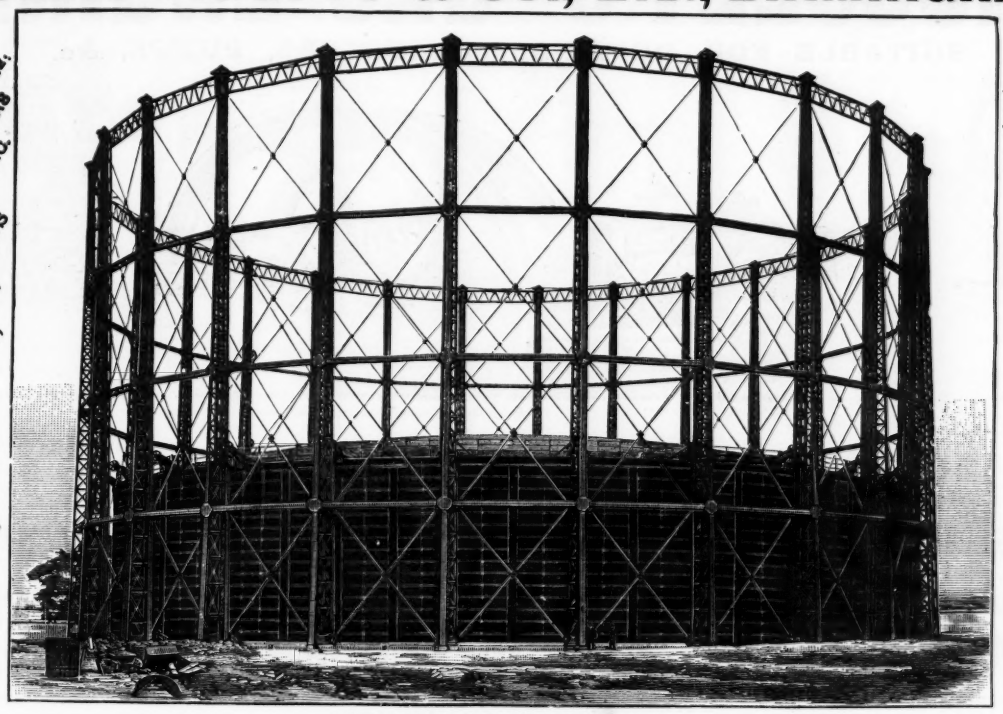

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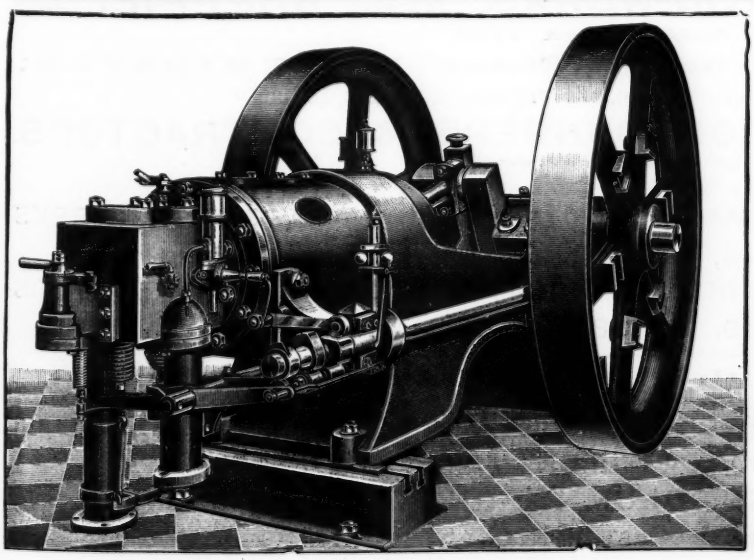

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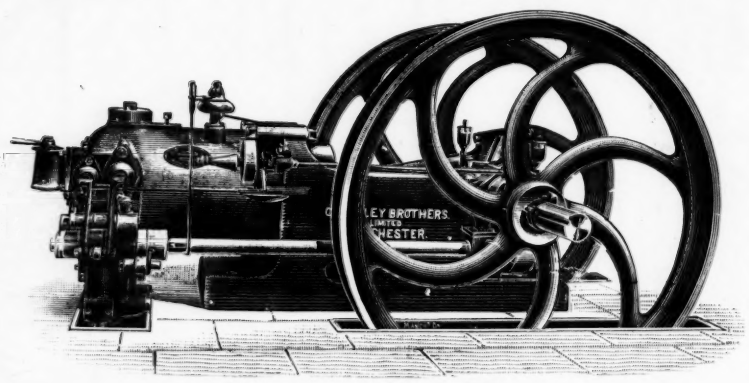

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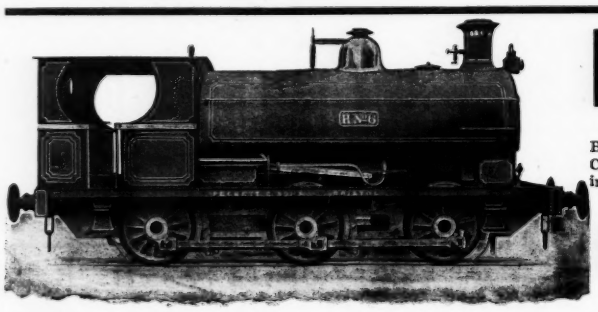

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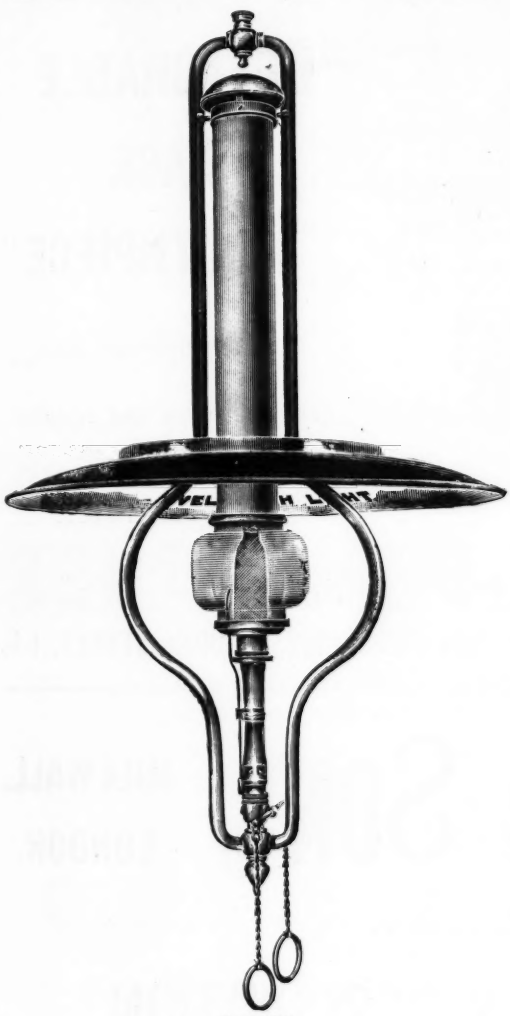

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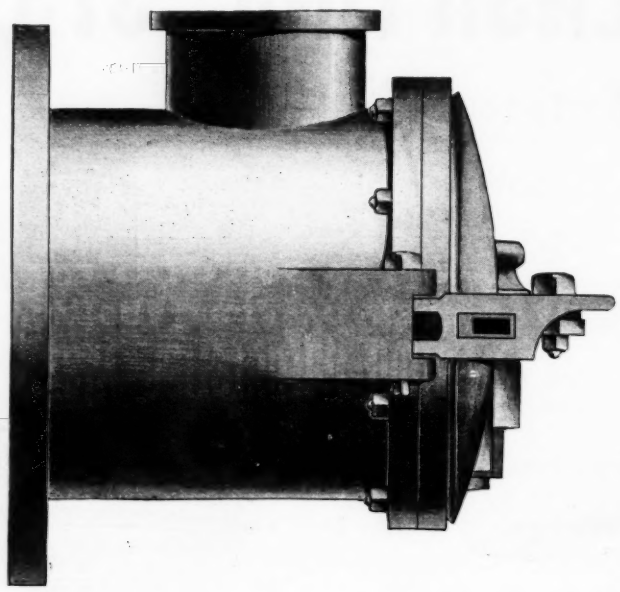

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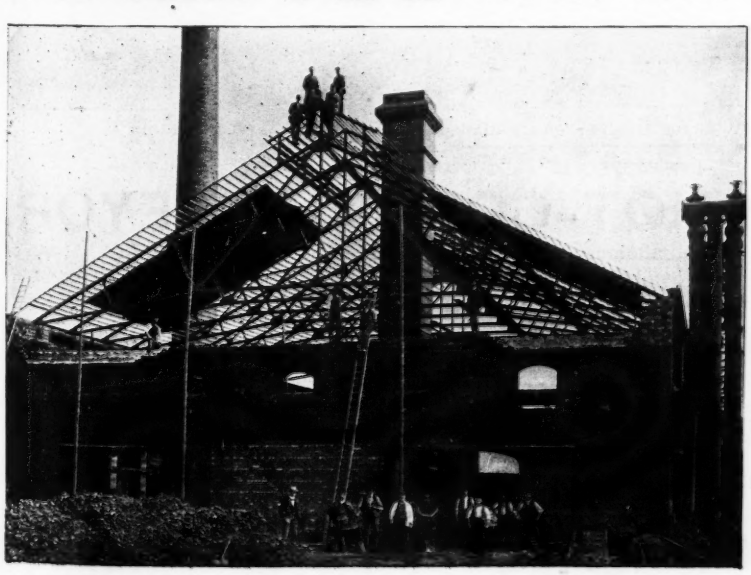

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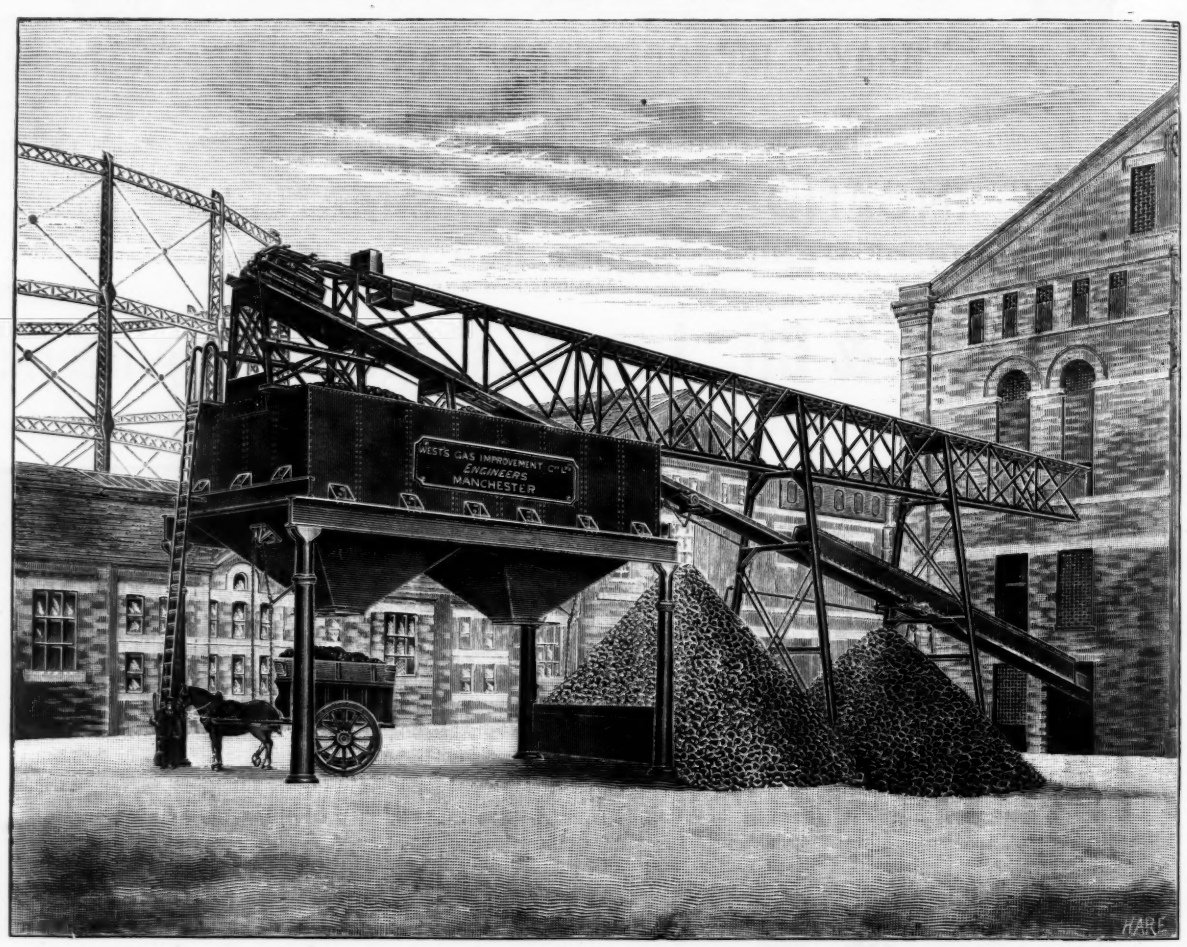

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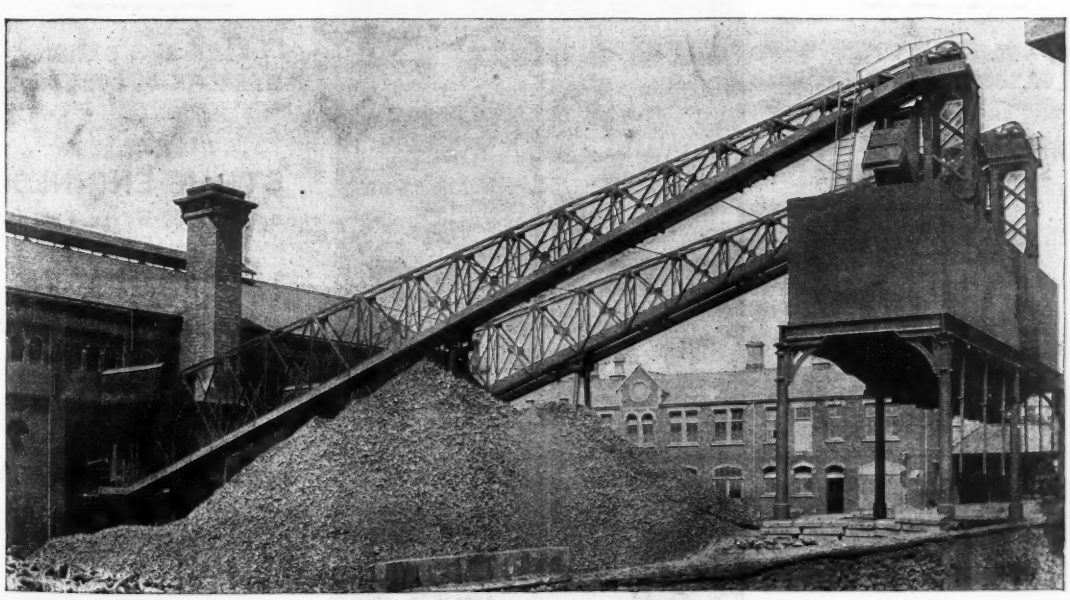

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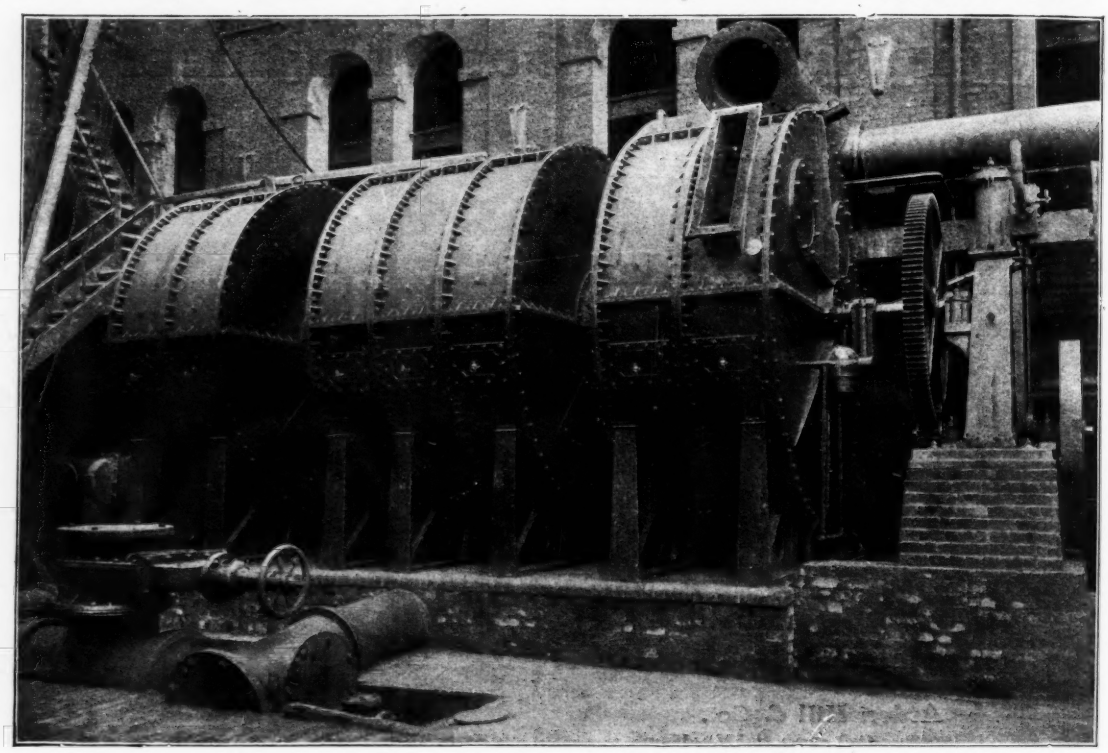

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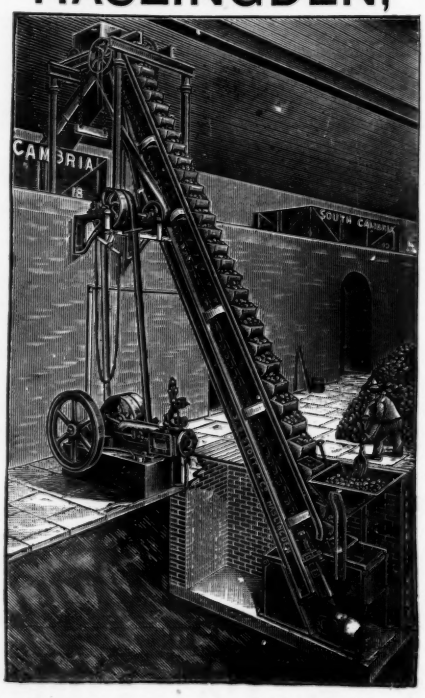

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EDITORIAL NOTES.

The Question of Municipal Works Depreciation.

THE burning question of the relationship of the sinking fund and depreciation allowances of municipal electric lighting undertakings, is dealt with again in the letter which we publish to-day from Dr. Panton, Chairman of the Electricity Supply Committee of the Bolton Corporation. As we have already observed with reference to the case of Edinburgh, we are delighted to be able to come to close quarters with this question, as it affects particular examples. Our esteemed correspondents will no doubt do us the justice of admitting that we have not presumed to lay down a hard-and-fast rule for the amount of depreciation to be allowed, either as a general rule, or in a particular case. All that has ever been advanced by the "JOURNAL" in a general way, in this respect, is that depreciation, in one shape or another, is a necessary element of the expense of running an electricity supply plant which ought to be allowed for in the charge made for the service. We were not the first to discover, nor are we the only witness to make the representation, that the electric lighting property of local authorities is not, upon the whole, adequately "depreciated" in the accounts; nor is the rate of loan repayment sufficiently rapid. There appear to be exceptions that prove the rule; and our correspondents claim that Edinburgh and Bolton properly belong to this category.

The main reason for this contention is that the rates of repayment of capital in these cases are very high. Let us say at once that the plea is a just one. Where the period fixed for the repayment of money borrowed to be laid out in electrical plant and machinery is calculated with reference to, and is limited to the probable life of, the plant in question, it may be admitted that the depreciation is almost covered by the sinking fund. This is the principle adopted by the London County Council with regard to its electric lighting loans to the Metropolitan Local Authorities; and the only disadvantage of it is that the latter do not like, and will not submit to it. They accordingly prefer to obtain their electric lighting capital advances elsewhere, which the London County Council cannot prevent them doing where the statutory permission exists. If the Local Government Board intend for the future to act on the same principle, and local authorities are willing to fall in with the arrangement, there is no more to be said. But the fact appears to be that where a local authority does not accept this scale of loan repayment, there is nothing to prevent them having recourse to Parliament, which will generally grant easier terms of repayment. This very subject was publicly mentioned in the course of last session, when both the Board of Trade and the Local Government Board represented that it was useless for them to try to make local authorities pay up sharply on their commitments, if Parliamentary Committees continued to allow them so long a tether.

The truth of this matter is, that both the Government Departments and the London County Council have seen reason to reconsider the idea with reference to which the period of repayment of this class of loans was first determined. Originally, the lifetime of the asset for which the money was required was not regarded; the advance being made as part of the general financing of the borrowing authority. It was assumed that the authority would keep up the value of the investment. But when it was made apparent that the ordinary local authority had no intention of doing anything of the kind, and some of them, like the Dublin Corporation and the St. Pancras Vestry, proclaimed it to be their decision that the sinking fund should be regarded as the depreciation fund also, this was a challenge to the higher financial powers to take them at their word, and make it so for the future. This is the reason, we take it, why municipal electric lighting loans of 40 years' duration became loans for only 23 years, or thereabouts. The older electricity supplying Corporations, like Glasgow, may get off with something less than a 1 per cent. sinking fund, which clearly cannot cover depreciation. Bolton, which pays nearly 4 per cent. under the same heading, is plainly in a different case. Those local authorities who find themselves upon uncertain ground in this regard cannot do better than follow so excellent an example. Obviously, it does not matter what the provision for ensuring a state of solvency is called, so long as the obligation is satisfied.

The Use of Flueless Gas Warming-Stoves.

IN another column will be found the full particulars of the experiments of Dr. Thorpe, mentioned in the "JOURNAL" for Aug. 18 last, designed to ascertain the effects of burning gas and oil in certain descriptions of heating-stoves used in factories and workshops. The information is contained in the Annual Report of the Chief Inspector of Factories and Workshops, which likewise embodies a mass of other most interesting matter showing how carefully the sanitation of workplaces under the Act is attended to. It would be well if those malcontents who are everlastingly abusing the English factory system would give themselves the trouble to study the various and always devoted labours for the good of the workpeople, of Dr. Arthur Whitelegge and his staff. It is a century since the first Factory Act was passed, in 1802; and at the close of the centennial year 1902 there were no less than 100,424 factories and 145,721 workshops on the registers. These totals include laundries, but not workshops for men only, domestic factories and workshops, docks, or warehouses.

To show the way in which the work of the Inspectors tends to increase, the inspection of electrical stations and Mond gas-works is mentioned. The manufacture of motor-cars and liquid air is marked among the new industrial developments of the time. Steam-engines are said to be giving place to gas-engines, and both to electric motors, with very manifest advantage in the disappearance of dangerous fly-wheels, shafting, and pulleys. The tendency to remove works from town to country, and from inland to the coast is again remarked. The question of the effects of lighting and heating upon the air of factories and workrooms is introduced as part of a general inquiry into the possibilities of aërial sanitation. It is allowed that while the importance of adequate ventilation and the injurious effects of re-breathed air cannot be gainsaid, it is not practicable in any inhabited room to maintain the air at the same level of purity as outside. Any relative standard of purity must be arbitrary, and depend on the circumstances. We shall make another opportunity for going into this matter, and must for the present confine our attention to the particular subject of Dr. Thorpe's investigation.

The new Act requires that the means of warming workrooms shall be such as not to foul the air; and this directly raises the question as to the suitability of flueless stoves. There is a large trade in this class of warming appliances, to which every simple oil-lamp and gas-burner used during the daytime belongs. Consequently, the inquiry as to the wholesomeness of such stoves possesses a very far-reaching character. The Chief Inspector sums up the result of Dr. Thorpe's investigations on this head by stating that while all stoves of this special class give off impurities, the most dangerous product, carbonic oxide, is usually in such small proportion that, with proper ventilation, it could not reach the percentage that has been found to be mischievous. The conclusions Dr. Whitelegge draws are: That flueless stoves vary in their output of injurious products, including traces of carbon monoxide; that they do not aid ventilation, but directly increase the need for it and the amount required; and that, given adequate ventilation, certain flueless stoves may be used without demonstrable risk. There is a converse problem, which is that of keeping the atmosphere of hot workrooms down to a reasonable point when the processes in use entail the employment of heated stoves.

The happiest feature of these official observations is the evidence they furnish that Dr. Whitelegge and his staff are not disposed to pronounce judgment upon a matter of this

kind on *a priori* grounds. We know the temptation that besets an official inspector, thoroughly well grounded in the principles (say) of ventilation, to declare off-hand that any means of warming an interior which entails the discharge of the products of combustion into the air must be wrong. This is the sort of "scientific" treatment of the cognate question of sulphur in gas, which is meted out to gas manufacturers who have the misfortune of coming under the purview of pedantic chemists. It is a pity that the sulphur question likewise cannot be referred to the consideration of Dr. Whitelegge and Dr. Thorpe, and the investigators of the Government Laboratory and the Office of Works, who dealt with this matter of flueless gas-stoves. They were doubtless impressed with the knowledge that if a gas-flame could not be burnt in a workroom for purposes other than lighting, or an oil-lamp placed upon the floor to take the chill off the air, many of such places could with difficulty be warmed at all. However this may be, the Medical Inspector of Factories, Dr. T. M. Legge, treated the question of the wholesomeness of flueless stoves as an open one; thereby setting a good example to other inquirers.

Carbon monoxide and acetylene were the deleterious substances specially tested for in the escaping gases. It is rather striking that no acetylene was found in the products from any gas-stove, and very little carbon monoxide. As was to have been expected, the best results were obtained from the condensing stove with argand burner, in which the gas-flame burns itself out without touching anything, and the products of combustion practically throw down the sulphur as dissolved sulphuric acid. There is no sanitary advantage in burning gas atmospherically in such a stove; and where this is done with flame-contact, with so-called "fuel," carbon monoxide is formed, and connection with a flue should always be insisted upon. Oil heating "stoves," which appear to be merely lamps, make appreciably greater quantities of carbon monoxide than the better gas-stoves. This fact is worth knowing. There are only two further matters into which the investigations of the Government analysts might extend with advantage, and these are the proportion of sulphurous gas which gets into the atmosphere of a room warmed in this way, and the effects of gas and oil so burnt upon the humidity of the air. The latter is an important point in connection with stove heating.

Lord Welby on Municipal Borrowings.

The dignified protest placed upon record by Lord Welby, at last week's meeting of the London County Council, against the needless multiplication of municipal borrowings, deserves more respect than it is likely to receive from the more hare-brained of Progressives. We take particular notice of these warnings against the unmeasured increase of issues of what are classified as "gilt-edged" securities, because the reason assigned by Lord Welby for the observance of caution in this regard is precisely that which has already been mentioned in these columns. Whether the investments offered in the market are "gilt-edged" securities or not, the only source from which the money can be derived is the savings of the people. Lord Welby said as much last Tuesday, and the truth has been stated many times before. There must be a balance between the amount of investments offered, and the money available to take them up. Capital, however disguised, is nothing more nor less than savings. It is always difficult to measure the amount of the undivided balance of profit of a nation, to say nothing of the whole world. Finance has been internationalized for so long, that it is impossible to say how much money there is at any time in the world waiting for employment. Recent events have lifted the veil of mystery in certain places. Germany, for instance, has not had any money to spare these three years. France has a good deal of money laid by, as usual; but it appears to be kept in the traditional stockings of the thriftiest race in the universe. It is unnecessary to speak of America. It therefore looks as if, by the process of elimination, all other sources of funds for British enterprises besides native savings are ruled out. The question that remains, therefore, is as to the sufficiency of native savings to furnish the money required for all the purposes of the time. It is a question that cannot be definitely answered; but if we may believe the bankers, the surplusage of disposable cash in the country is remarkably small. If this is the case, it obviously does not matter whether securities are gilt-edged or even gilt all over, if there is a shortage of money, they cannot be bought at a fair price. This is the kind of reflection which prudent financiers are driven to indulge in at the present juncture. It is not that the credit of borrowers is low; but the money they require is not forthcoming. Let provincial municipalities and gas companies lay themselves out to tap the humble store of the investors who usually patronize the Post Office Savings Bank. It is their best hope. Meantime, the big borrowers must pause awhile, and go slow, in order to give the country time to recover from the waste of a costly war as well as the disappointments of a bad season.

Amendment of the Workmen's Compensation Act.

It is announced that the Home Secretary has appointed a Departmental Committee to consider and advise as to what amendments of the law relating to compensation for injuries to workmen are necessary or desirable, and to what classes of employment not now included in the Workmen's Compensation Acts the Acts can properly be extended with or without modification. The Committee has already begun to work, and it is highly desirable that those employers who have any recommendations to make should consider the expediency of concerting their procedure betimes. The Trade Unions will not be slack in making to the Committee their own representations, the nature of which is already pretty well known. It has been remarked in many quarters, that the chief disappointment of the principal Act has been the amount of litigation to which it gave occasion. But this was a transient difficulty, largely due to the fact of the Act being limited in its operation. There has been very little such litigation of late. Probably the Trade Union interest will make a dead-set against the "neutral zone" of the Act, and endeavour to bring all alleged injuries, however trivial, within the scope of further legislation. This must be resisted, even in the interest of working men themselves. Another question that is certain to arise is with respect to the working of the alternative arrangements permitted under the existing law. It has been stated that all the "contracting out" which was worth anything was done immediately upon the passing of the Act, and that the process then stopped. This is an observation on which additional light is desirable.

We have consistently applauded the Act as one of the most worthy pieces of constructive legislation ever placed upon the statute-book, and shall hail its extension, within reason, with equal satisfaction. At the same time, it is impossible to look upon the prospect of the application of the principle of the Act to all employments with the same confidence as one could feel with respect to the guarded operation of the original law of employers' responsibility. Some people talk of the litigation that followed the first Act as if it was a blemish of the scheme. But, unless extraordinary success attends the efforts of the draftsman of an enlarging Act to define who is an employer and who is employed in all possible circumstances, the second crop of litigation may be much heavier than the first. Is the person who gives another a copper to run an errand to be held responsible for anything that may happen to the emissary? This is only one of the cases that might arise under the extended legislation, unless its operation is limited; and then, of course, it must still be incomplete.

The State of the Mineral Oil Trade.

For some little time past, curious rumours concerning the mineral oil supply of the world have been in circulation, and the trades which have much to do with petroleum in its various marketed forms have been perplexed as to the course prices are likely to take. These are hardening all round; and the main question is as to the extent to which the movement can be carried. This is bounded by the prices which the different grades of the material can command. During the past two or three years, for example, while the so-called fuel oils have been cheap, persistent attempts have been made to burn them successfully for steam raising at sea and on shore. Scores of patents have been taken out for oil-burners for this purpose; and even the Admiralty has fitted a ship or two with these. Scarcely, however, had the experiments resulted in proving the feasibility of getting up steam with oil fuel by devices acceptable to marine engineers, than the cost of the fuel went up beyond its equivalent coal value. Even taking credit for every possible saving of labour in stoking, shipowners

cannot afford to pay £3 per ton for fuel oil. Probably this is an exaggerated figure, and only applicable to the case of steamers which cannot fill their bunkers in home or North American coaling ports. The scarcity of oil may be partly due to the collapse of the much-boomed Texas field, and partly to the effect of the tremendous Baku fires, which must have kept an enormous quantity of oil out of the market. The Hon. Evelyn Hubbard, the Chairman of the Russian Petroleum and Liquid Fuel Company, a short time ago told the shareholders that he had seen three enormous oil fountains blazing together, sending columns of fire 300 feet into the air, and consuming between them 30,000 to 35,000 tons of oil per day. Bad as the loss was, it had another meaning for the observer, and that was the enormous resources of the field.

At this juncture, a Russian proposal, emanating from a private source, was made to the Standard Oil Company to acquire Russian oil properties. Nothing came of the suggestion, probably for the sufficient reason that the Standard Oil Company can buy the whole of the Russian oil they may require without the necessity of undertaking the risk of buying wells. The proposal was rather an artless one in the circumstances, and need not be taken seriously. It was reported in the "Standard" of the 13th inst. that a Cartel of all the Austro-Hungarian Pretroleum Wells and Refineries was signed in Vienna, with the immediate result of a rise in the price of oil. Meanwhile, negotiations are afoot for the formation of a big European Petroleum Trust for all the Russian, Roumanian, and Galician springs and refineries, of which most of the capital is held in England. This would be in opposition to the American Trust. It should be borne in mind that the course of the market in gas and fuel oils will not necessarily follow the prices of kerosene. Indeed, it is possible that, if the value of lamp oils should continue to rise, that of residues may even fall, by reason of the large proportion of the latter which the refining of the lower qualities of crude oil will throw upon the market. On the whole, therefore, there does not appear to be any adequate reason, in the existing state of things, for buyers of gas oils to experience any alarm as to the prices of the immediate future. It is the price of coal rather than of kerosene which governs this market; and so long as coal is not dear, oil will never rule high. Nevertheless, of course, a certain degree of commercial prudence is desirable on the part of buyers; and those with large storage will always have an advantage. Gasholder tanks have ere now held other fluids than water; and they may do so again.

The Visit of the Italian Sovereigns.

The cheering crowds and enthusiastic scenes that were the outward signs of London's and the country's welcome last week to King Vittorio Emmanuele and his Consort are regarded by a correspondent who is deeply interested in Continental gas undertakings, as deserving of some place of record in our columns. They signified, he writes, the ancient bonds of sympathetic tradition between the Italian and British nations, and emphasized the extent and cordiality of their commercial relationships. The importance of such exhibitions of international sentiment and goodwill (like exhibitions of another kind) cannot easily be estimated; but the great influence they exert is none the less undoubted. The middle ages resounded with Italian greatness; yet modern United Italy only bears the years of a middle-aged man. Its progress—commercial, financial, social, and political—has been astounding. Its trade is developing rapidly; its paper currency is all but a thing of the past; its credit and exchange stand higher than ever; its influence among the world powers is increasing; its populace are becoming more emancipated, and learning by experience their power for good or for evil. As with all sudden growths after restraint, there are excesses to be curbed, and lessons of tolerance and proportion to be learnt. The stormy waters of uncontrolled Socialism have to be swum through, before the quieter haven of rational development and peaceful evolution be reached. The former period cannot help but be a time of uncertainty and anxiety to those with interests involved, and, indeed, to all onlookers of the world's progress. British capital is largely invested in Italian industries; and its gas undertakings are by no means the least important. The times have been and, in some aspects, are no doubt troublous. Municipalization is in the air; and the microbe is not likely to be caught or killed. But such municipalization will very probably prove much less terrible in the realization than in its anticipation. Commercial justice and a fair bargain can be hoped for; and such security is ensured and increased by interchanges of Royal courtesies such as those of last week.

A New Departure at Technical Meetings.

The last number to hand of the "Journal of the Society of Chemical Industry" contains an instance of a new departure which has been taken in connection with the meetings of one of the Sections of the Society. It appears that the idea was mooted that a series of short biographical accounts of men who had made their mark on the history and progress of chemical industry would be interesting and perhaps useful. Accordingly, at the opening meeting of the Newcastle Section, last month, the Chairman (Dr. J. T. Dunn) gave the members an account of the life and work of the late John Glover, whose name is well known to the gas profession in connection with the tower which bears it. The object of Dr. Dunn's remarks was one who, as he told his audience, had influenced fundamentally at least one very important branch of chemical industry. Moreover, he was connected with their own district, was a member of their particular Section, and was the Society's first medallist. Dr. Dunn was fortunate in having seen something of Mr. Glover, and he knew enough of him to admire many points in his character; but his acquaintance began only towards the close of that remarkable man's active career. However, with the aid of Dr. Lunge's well-known work on "Sulphuric Acid and Alkali" (a review of the latest edition of which appears in another column), and of information obtained from the deceased chemist's relatives and friends, he was able to present a very interesting account of one who, by the application of the abilities with which he was endowed, effected almost a revolution in his particular branch of industry. It is specially worthy of mention, too, that for his invention of the tower he never took out a patent or tried to keep it secret. We do not call attention to this new departure by the Society of Chemical Industry to dwell upon Glover's work, but to express approval of the notion of bringing before the younger members of a technical body some of the incidents in the lives of the pioneers which have proved of conspicuous benefit to the world at large. And while they are hearing of the work of these men, they will do well to bear in mind that it was performed without the advantages afforded by the polytechnics and technical schools, and all the elaborate appliances with which they are equipped, which are now so plentifully distributed all over the country. What might not John Glover, the plumber's apprentice, have done with these at his command!

Lessening the Scope for Electric Street Lighting in London.

Coming upon the scheme of public lighting improvement which the City Corporation have resolved to carry out by means of incandescent gas lighting, it is interesting to learn, from a weekly paper devoted to London municipal affairs, that the Paddington Borough Council have had under consideration a proposal to "turn over the whole of the lighting of the borough to the Gaslight and Coke Company, and to entrust to the Company the execution of the work in connection with the extension of the lighting." The proposal, however, is not to be altogether fulfilled, so far as the Company are concerned. Their estimate of the price at which they were willing to undertake the work, it appears, was £8639 18s. 3d., if the average meter system is continued, and £8447 18s. 3d. if the scale system is adopted. The present cost to the borough of the public lighting is £8245 10s. 9d.; and the Borough Engineer has calculated the cost under the scale system at £8043 15s. 4d. From this, it seems that the Council can carry out the work more economically than the Company. In consequence, the idea of handing over to the Company this part of the scheme, according to the information at the moment available, has been abandoned by the Council. Whether in the event it would not have been better, for the sake of £400 a year on such a large scheme, to have given the work entirely to the Company, time alone can show. But the Company's offer in one respect has been successful. They are to be allowed to execute the work connected with the scheme for increasing the number of gas-lamps in the borough; their tender having been £6243, as compared with the Borough Engineer's estimate of £7200.

There is no doubt about it that in the Metropolitan districts the progress of electric lighting for public purposes has been brought almost to a standstill; and the large contracts for incandescent gas lighting that have been entered into (to which reference has been made in recent volumes of the "JOURNAL") will soon leave little room for further expansion in street illumination for the electrical competitor.

Municipal Electricity Works

So much has of late been said and written with reference to the electrical branch of municipal trading, that anyone not intimately acquainted with all the facts of the case might well be pardoned for thinking that the subject had been completely exhausted. But the way in which far too many electricity undertakings are conducted by public bodies, makes it absolutely impossible that agitation on this important matter should cease until some well-defined rules are laid down for general application to such businesses. The divergencies in present practice are so great that it is often exceedingly difficult to judge precisely the financial position of a given concern; while, for the same reason, exact comparison of one undertaking with another is frequently rendered altogether out of the question. It may in some respects be impracticable to lay down hard-and-fast regulations to be observed in every case; but there certainly are directions in which uniformity is most desirable, and at the same time perfectly practicable. The most prominent matter in this category is, of course, depreciation, with regard to which there seems to be no reason whatever why fixed rules for application in every case should not be laid down. The need there is for the provision of such a fund has over and over again been pointed out in our pages, as well as elsewhere; and in to-day's "JOURNAL" there appears a "Communicated Article" on "Municipal Electricity Works," in the course of which the author clearly demonstrates the soundness of this contention. But this is only one of the many interesting points dealt with by the writer, who has set forth his arguments in such a manner that they cannot fail to appeal to the lay mind. Excellent use is made of the familiar hypothetical landlord and tenant to illustrate some of the principles which are insisted upon.

And the Supply of Power.

The suggestion contained in the article that the tables might be turned, by those who consume electric current for lighting purposes claiming to have their supply at the low rate now granted to power users (on the ground that the machinery is employed during the day for the latter purpose, and would be idle at night if not utilized for lighting), may not at the first blush seem to be so impossible as a little consideration will make it clear is the case. Such a proposal could not work at all in practice, for the very obvious reason that if the custom of the power users is to be obtained to any considerable extent, the current must be supplied at such a price as will make it worth people's while to take it. There is a point beyond which it does not pay to employ electricity for motive power purposes; and the cost must always be the chief consideration to manufacturers. The question, therefore, which the owners of electricity works have to decide, is whether it will be better for them to supply power on the only terms which it is possible for customers to accept, or to do without this class of business altogether. This consideration, too, is not, it may be remarked, confined to the purveyors of electricity, but applies also to gas undertakings. Altogether, however, the article to which we draw attention is eminently suited for distribution in places where it may be thought desirable that the attention of the ratepayers should be called to the position of the local municipal electricity works; and gas companies may perhaps regard it as their duty to become the disseminators of the useful criticism which it contains.

Insects and Incandescent Gas-Lighting.

Among the difficulties with which those in charge of the gas supply in hot climates have to contend, is the one occasioned by the magnetic influence which incandescent gas-lights have for insects—fortunately for a season only. These little winged creatures give a great deal of trouble, and cause injury not only to the mantles, but (as will be readily understood by those who are aware of the detrimental effect that slight accumulations of dust have upon incandescent burners) detract considerably, if constant attention is not expended upon the lamps, from their best lighting efficiency. At the meeting of the Oriental Gas Company last Wednesday, the Chairman (Mr. R. Hesketh Jones) handed round for the inspection of the shareholders a bottle containing a number of the insects which are such a nuisance to the Company's public lighting staff in Calcutta. It is, of course, impossible to hermetically seal a gas-lantern. There must be ingress and egress somewhere; and these persistent little things, which are not attracted to the lamps singly but in perfect hordes during a short part of the year, will get in any little crack or hole whether at the top or bottom of the lamp; and if the apertures are too small for them to pass entirely in, then they will do their best at choking up the inlets or outlets. Under such circumstances, fine gauze protection can be of little avail. As remarked, the insects occasion trouble only for a season; and during that period they are no doubt beautifully anathematized by the Calcutta lighting staff. The rainy season is due to begin about the second week in June; and the rains continue through July, August, and September, until the middle or end of October. The insects commence to be troublesome about August, and continue so through September, gradually diminishing as the cold weather approaches. During the time that the pest is at its worst, in the mornings the insects are found thickly strewn for about a yard round the feet of the lamp columns; and during that time, in order to maintain the lighting in good condition, the lamps are cleaned out daily. The trouble that is found with incandescent gas lighting in this country is insignificant as compared with this kind of thing; and yet in Calcutta incandescent gas lighting is very popular.

The Workman and the Machine.

The opposition of gas-workers to the labour-saving machine is fast wearing out. The fear of the men, which a few years ago was rubbed up to irritation point by their leaders, that the introduction of machinery would deprive a large number of their livelihood has been almost, if not completely, composed by the facts produced by time. The use of labour-saving appliances in most gas-works has only had the effect of taking up increased business, and not that in all cases; and it has had the accompanying beneficent effect (which the men, if they honestly spoke their minds would acknowledge and have learnt to greatly appreciate) of giving them greater ease and comfort in their work. These points were proved in a speech recently by Alderman Lowden, the Chairman of the Leeds Corporation Gas Committee; and he was prompted to the making of the statement by the usual electioneering exaggeration of one of his political opponents on the Council. Speaking of the adoption of labour-saving processes, Alderman Lowden brought out the fact that 18d. per ton of coal carbonized had been saved; but there are now more men at work than in 1895. For example, at the Meadow Lane station in that year 380 men were employed; 415 now find work there. In the meter shops 90 men found employment in 1895; there are no less than 146 to-day. Of the 18d. saved, 9d. has been given to the workers by shortening their hours and advancing their wages. In October, 1895, the wages paid in the gas-works amounted to £6690; in the same month this year £8051 was paid. There is actually £300 a week more being paid in wages per week at present than in 1895. These facts should silence those who harp upon the injury that has been done to the worker by the introduction of machinery in the process of gas manufacture.

West's Stoking Machinery and Conveyors for Copenhagen.—The Municipality of Copenhagen have decided, after a recent visit of Herr Winfeld-Hansen, the Director of the Gas and Electricity Department, and Herr Irminger, the Engineer of the Eastern Gas-Works, to several Continental and English gas-works, to equip the new retort-house at their Valby Gas-Works with West's compressed air stoking machinery and coke-conveyors. The new works at Valby, which are being designed and erected under the direction of Herr Irminger, are being laid out to eventually be capable of a daily output of 20 million cubic feet; and the first section is being equipped with a retort-house containing 32 through beds of eights. One pair of West's compressed-air machines will operate upon the whole of the 32 beds; and the retort-house is to be equipped with four sets of coal breakers and elevators on each side with reversible band conveyors across the retort-bench, so that the whole of the house can be supplied from the coal-store on each side if necessary. The capacity of the storage hoppers is to be sufficient to dispense with coal elevating during the night. Hot-coke conveyors are to be placed in front of the retort-benches, and extend to the coke-yard, so that the coke can be delivered into storage hoppers or into the coke-yard.

WATER AFFAIRS.

The Metropolitan Water-Works Arbitration.

THE proceedings in this important arbitration were resumed on the 16th inst., and, with the exception of Wednesday, were continued throughout the week. The case for the Water Board against the claim of the East London Water Company had been closed just before the adjournment on the 7th inst.; and when the sittings were resumed, Mr. Balfour Browne, K.C., the leading Counsel for the Company, announced that he did not propose to call rebutting evidence. He, however, put in an amended table, showing that the effect of the exclusion of the sinking fund of the Chamberlain of London was to reduce the Company's net maintainable income to £144,653, which multiplied by 36·36 years gave a capitalized value of £5,260,000. According to the table, the claim amounted to £6,417,889. But to this there was to be added an allowance of 1 per cent. for re-investment, a like sum by way of compensation for loss of interest pending re-investment, and the costs; bringing up the total claim to £6,583,964, compared with £7,248,112 originally put forward—a difference of £664,148. Mr. Fletcher Moulton, K.C., then proceeded to sum up the case for the Board. He submitted that the doctrine of maintainable income did not apply at all in connection with the Company, and that the question for the Arbitrators was the valuation of a decreasing income. In arriving at a sum which would be fair compensation, he suggested that they must take into consideration the fact that the Company were drawing their supply direct from the Lea, the increasing pollution of which above the intakes might give serious trouble and entail large expenditure in the future. He contended that this undoubtedly lessened the value of the supply. Mr. Balfour Browne, in reply, animadverted upon the action of the Board in questioning the stability of the Company's income, which he said was shown, by the figures he had put in, to be absolutely well secured and maintainable. He laid stress upon the point that the Board were not taking over the concern as it existed five years ago, but as it is to-day, and that therefore an average was inapplicable. This brought the case to a close; and the President announced that the Arbitrators would consider their award.

Mr. Balfour Browne then opened the case for the New River Company, who claim, first, such a sum in water stock as will produce £350,000 annually; and, secondly, the recoupment to the Company, by a cash payment, of £63,706 spent up to the 31st of December last, and £51,500 on account of estimated expenditure up to the "appointed "day," in connection with the Staines reservoirs scheme. A further claim is made in respect of costs, charges, and expenses. The whole of the first portion of Counsel's address was devoted to the history of the Company, with the details of which most people engaged in the supply of water are familiar. He pointed out that the Company occupy a peculiar position—being both purveyors of water as well as owners of land. This peculiarity was recognized in the Metropolis Water Act of last year, in which provision is made in section 9 that the sum payable to the Company as compensation for the transfer of their undertaking shall be discharged "wholly in water stock." He put in the accounts for the past year, and a statement showing the estimated increase in capital expenditure, water-rentals, &c., in each succeeding year down to 1907, by which time the limit of the present resources will have been reached. It was, however, upon the figures for the year 1904 that he contended the concern should be taken over. The divisible profits in that year had been computed at £339,801; and this sum multiplied by 36·36 would produce £12,356,400, which the Company said was the present cash value of their undertaking. There were further claims for additional profits in respect of the three years to 1907; bringing up the total amount to £13,139,377. They also asked, as already mentioned, for £115,241 and interest in respect of the Staines reservoirs scheme; and this brought up the total claim to £13,260,164, estimated on a future of five years from the present time.

A long argument took place upon a contention of the Board that, under the Water-Works Clauses Act, 1847, the Company were limited, in the division of their profits, to the maximum amount of the dividend on the capital raised and expended. Mr. Cripps, for the Company, contended that no such restriction was applicable to them. Mr. Moulton, on the other hand, pointed out that the Company's Act of 1852, by which their charge for water was limited, specifically excluded certain sections of the Act of 1847; and he argued that this supported his view that the rest were intentionally left in for the purpose of limiting the amount of profit. On Saturday, Sir Edward Fry delivered the judgment of the Court on the point, and the text will be found in another column. It will be seen that it is adverse to the contention of the Company. Mr. Balfour Browne said this was a decision of such vital importance that he thought he was entitled to ask the Court to state a special case, and the President acknowledged that the learned Counsel was entitled to it. Pending the decision thereon, the Arbitrators will proceed with their inquiry into the Company's claim on alternative tables—one set framed upon the assumption that they are entitled to unlimited dividends, and the other in accordance with the decision that they are restricted to 10 per cent. The Court then adjourned until yesterday.

Improved Plumbing and Waste Prevention.

THERE are very few householders who will hesitate to acknowledge that the approach of winter, more particularly if accompanied by the occurrence of a few days of frost, causes them to turn their thoughts to the condition of their water services. They are never sure that they may not, at some inconvenient hour, have to seek the assistance of a plumber; and their past experience of the work of this class of artisan may not have been such as to inspire a great deal of confidence. In fact, the plumbing is the weak point in most houses; and the result is great and unnecessary waste of water. This is a matter in which plumbers are concerned equally with the suppliers of water—whether companies or corporations; and therefore it was a praiseworthy act on the part of the Plumbers' Company to convene the conference of which a report will be found in another part of the "JOURNAL." The Company have been trying for some time to raise the status of plumbers by improved training; and the result of their efforts has been the registration of about 12,000, all over the country, as thoroughly qualified men. They now seek the co-operation of architects and suppliers of water in their endeavour to obtain the necessary legislation in furtherance of their object; and this was accorded, in general terms. Of course, as pointed out by Mr. Searles-Wood, representing the Royal Institute of British Architects, no pledge could be given by that body to only employ registered plumbers, inasmuch as architects do not interfere between the contractor and the men he employs. Moreover, as Mr. Lees, the Secretary to the Water Committee of the Birmingham Corporation, and others, remarked, there are unregistered plumbers whose work is in all respects satisfactory. It would be obviously unfair to deprive these men of work on the ground of non-registration. The object of the movement is to encourage registration as a guarantee of efficiency. The delegates also discussed the question of the prevention of waste in the domestic use of water; and a Committee, representing the Plumbers' Company, the British Association of Water-Works Engineers (whose Secretary, Mr. Percy Griffith, M.Inst.C.E., was present), the water authorities, and architects, was formed to consider the question of framing regulations and standardizing fittings. It is rather curious that when the London Water Companies not very long ago proposed, at the suggestion of the Local Government Board, to introduce a revised set of regulations for the supply of water, their action aroused such public indignation that the attempt had to be abandoned. And yet the necessity for some change in the existing conditions is practically admitted by the appointment of the Committee. It is to be hoped their efforts may be more successful than those of their predecessors.

British Association of Water-Works Engineers.—As already announced, the winter meeting of the Association will be held on the 12th prox., at the rooms of the Geological Society at Burlington House. Three papers, we now learn, will form the chief features of the proceedings. The first will be by Professor Henry Robinson, on "The Storage of Flood Water;" the second, by Mr. Alfred J. Jenkins, on "The New Reservoir for the Hoylake and West Kirby Water-Works;" and the third by Mr. Neil J. Peters, on "The Cogan Extensions of the Cardiff Corporation Water-Works." The Council and officers for 1904-5 will be elected at this meeting.

ESSAYS AND REVIEWS.

PROFESSOR ARMSTRONG ON THE REIGN OF THE ENGINEER.

It has occurred to us, in pondering the long question of the possibility of ameliorating the lot of the working man by changing the method of recompensing him for his labour—whether after the fashion of profit-sharing and co-partnership set by Sir George Livesey or otherwise—to bring into the problem the factor of the raw material of such experiments, and its preparation. It is not only in regard to the question of Labour that this obligation to give due consideration to an antecedent element exists. When one surveys the whole field of industry, with the object of ascertaining the state of affairs brought about by the actions of employers as well as of the employed, it is equally evident that the groundwork of the industrial scheme is a very important part of it. By a coincidence, this very same line of inquiry has been chosen by Professor H. E. Armstrong for following up to some distance in an article in the current "Quarterly Review," entitled "The Reign of the Engineer," in the course of which he treats of the everlasting topic of the transference to Germany of the once English chemical industry of the coal-tar products. We call this an everlasting topic, because it is continually cropping up in debates on the British industrial position; and very rarely is the treatment of the subject according to knowledge of the facts. Of course, as with all large affairs, this business of the coal-tar products manufacture has many sides, every one of which strikes somebody as possessing overwhelming importance. It has been explained by Mr. Ivan Levinstein, for instance, as attributable to the defective state of the English patent laws at the period when patent right in Germany did not exist. This favoured piracy; and, according to Mr. Levinstein, such was the character of the first planting of the coal-tar colour industry in German soil.

This explanation, however, albeit valid so far as it happened to be true, did not account for the remarkable subsequent development of the trade in Germany. Pirates may be good at looting; but unless they are something more than pirates, they do not make good use of their plunder. Professor Armstrong now advances a fuller explanation, which, unless we are mistaken, is also the one held to be correct by Sir George Livesey, who has personal knowledge of the founders of the coal-tar colour industry in this country. It was simply this: That the first manufacturers of coal-tar dyes made a large fortune, and did not care what happened afterwards. They therefore allowed their best chemist, Professor Hofmann, to return to Germany. In Professor Armstrong's words: "Manufacturers here had done little to keep in touch with their industry; in fact, they had relied too much on Hofmann to do their laboratory work for them. They were satisfied to go on making the dye-stuffs they originally produced. Having long held command of the market and amassed large fortunes, they did not see the need of new inventions; they therefore kept no adequate scientific staff in their employment." The picture is only too familiar in its broad lines. The firms who made fortunes by the sale of mauve and magenta were content. Does not one hear an echo of applause of this exercise of an old-world virtue? They were content. They let the cares of business slide from them as soon as the individual partners thought they had enough money to retire upon. Perhaps they founded county families, and entered Parliament. It was very English, if they did. No grasping "Trusts," in this case, to call down denunciation from the cheap politicians of the day. But, on the other hand, there was no care to keep the business going. Somebody, about this time, discovered a new series of coal-tar products—the diazo-compounds. He would willingly have worked for the English manufacturers of such things; but they did not see the advantage. They were not scientific men personally, and had no sympathy with chemists who were men of science. Whether this was due to defects of nature or of education, the fact remained. "It is an open secret that Griess would have taken service with the successors of Simpson, Maule, and Nicholson, had they been willing to give him an adequate salary; that Professor Dewar, who now enjoys a distinguished reputation on account of his extraordinary originality and skill as a manipulator, was equally ready to join them; and that Caro would not have left England had he seen any prospect in remaining. English manufacturers simply gave away their chances. The field of the azo-dyes proved to be a most fruitful one. It was explored in every direction in the laboraties of the German works; and hundreds of patents were taken out in consequence."

The trouble is simply that there has been in England no such appreciation of science by manufacturers as that which has availed to change the face of Germany within the lifetime of the present generation. Professor Dewar told the Sub-Committee of the Technical Education Board that "there is no doubt that this coal-tar colour industry could have been maintained here, had manufacturers adopted the same principles as in Germany, and had written off (say) £10,000 a year for the purpose of research work." Professor Armstrong proceeds to inquire why such a difference should exist between ourselves and Germany on this account. Why had Liebig so abiding and extensive an influence in his own country, so limited an influence here? For Liebig's life-work consisted essentially in the creation of a new kind of industry—that of experimental scientific research. Professor Armstrong says of him that "probably no other single man has done so much to promote the industry of brain development." Here follows an observation which is an anticipation of the gist of our recent articles. Liebig was successful, where he did succeed, "because the seed fell on fruitful soil." Here we join hands with Professor Armstrong.

The ground for Liebig had been prepared more particularly by Wilhelm von Humboldt, who, when he was Prussian Minister of Education in 1810-12, established a State examination for all schoolmasters, and developed the school-leaving examination. Many years later, therefore, when Liebig's appeal came, it was to an educated and teachable people, not overburdened with prosperity. The great employers were not wealthy persons with a classical education, Members of Parliament, dwellers in country mansions. The country had its industries to make, and knew it, from top to bottom. We will put it in this way: Whereas the over-prosperous British manufacturer did not greatly care what happened to the trade that had made his wealth while the foreigners had been fighting among themselves, the same foreigners, when they ceased quarrelling, and turned to work, felt the necessity for improving the trades to which they addressed themselves. The British manufacturer hardly cared to provide for depreciation. The foreigner was willing to set aside something considerable for improvement.

Again, the root of the difference lies in the matter of preparation of the soil. The British industrial soil may be really more fertile than the German, or than any other. We believe that it is, without merely flattering ourselves. It is only necessary to take a glance at English achievement to be confirmed in this good opinion. But it cannot be denied that the preparation given to the soil has hitherto been about as bad as it could be. The instilling in the youthful mind of the desire and ability to acquire and apply useful knowledge, has been confined to the scions of what are classified as the non-influential order. The natural leaders of the people have been taught nothing but useless knowledge, mitigated by games. Naturally, the result of this system has been that "the average University product has never appealed to the manufacturer"—that is to say, as a competent assistant in his work. The manufacturer's son has often been made such a product; but only with the object of attaining social distinction, not of making him more useful in the shop. In extenuation of this proceeding, it may be conceded that even in Germany, where the triumphs of scientific research have accomplished so much for the coal-tar colour and drug manufacturer, the benefits of scientific training for industries of a more settled character, giving less scope for expansion, are experienced at a later stage. The point is, that the example set in applying science to industry in the colour-works has gradually spread to all branches of manufacture in Germany, as it has not yet done in England.

Much more remains to be said on this most interesting and important class of subjects connected with British manufacturing industry; but we will leave it for the present with this statement of the sense in which the element of the raw material, or the soil, and its preparation, enters into the problem on the employers' side. Professor Armstrong sums up this part of the general question: "Primarily, it is the so-called man of business who is out of his depth in our country at the present day; and, until he is made aware of his narrowness, and led to respect the engineer, it will be impossible for industry and science to stand on 'a footing of deepest mutual appreciation, one ever influencing the other.'"

ELECTRIC LIGHTING MEMORANDA.

The Inaugural Address of the President of the Institution of Electrical Engineers—A Census of Electricity Supply—The Steam-Turbine and the Gas-Engine.

The current issues of our electrical contemporaries are full of presidential addresses. Last Thursday week, the President of the Institution of Electrical Engineers—Mr. R. Kaye Gray—delivered his Inaugural Address at the Institution of Civil Engineers, Great George Street, before a large and distinguished company. Mr. Gray belongs to the senior branch of the profession—being a "telegraph man," as he described himself; for which reason his name has not become known to those whose interest in matters electrical is confined to the technic of what the Germans call "strong currents." By reason of his position, Mr. Gray is able to survey the newer developments of electrical engineering from a detached standpoint, yet with expert insight, which makes his observations exceptionally interesting. The first topic to which he directed his attention was the state of the law of electricity supply. As he truly remarked, there has not been any fresh public legislation upon the generation and supply of electricity since 1888, when an Act was passed to amend the Act of 1882. If these Acts had been adequate to the needs of the industry at the present day, this absence of fresh legislation would not have mattered; but the fact is quite otherwise. These laws are based upon the parochial idea of electricity supply for lighting and power; and they make no provision for the case of electricity generation in bulk, and its distribution over a wide area extending far beyond the boundaries of any

particular parish or municipality. Besides, the Act of 1888, while ostensibly passed to encourage the introduction of electric lighting, went far towards stifling private enterprise in this direction, by giving to local authorities a veto on any petition to supply electricity within their areas. Thus it has come to pass that, in spite of the great progress made since 1888 in the science and practice of electricity distribution, no one but a local authority has to-day unimpeded access to the Board of Trade with a petition for a Provisional Order; and as local authorities are as jealous of one another as they are of private companies, the general result is that the municipal area is still the usual unit area for distribution. It is hoped that the Board of Trade Bill of last session for amending the Acts will be reintroduced and pushed forward. Mr. Gray was very indignant at the action of Parliament in granting exclusion of municipal electricity supply areas from bulk schemes; denying that the local authorities are necessarily the best judges of what is good for themselves or for the country in this regard. His point was that if all the towns which constitute the "fat" districts are cut out of these schemes, leaving only the "lean" rural districts for the large-area companies, there can be little or no hope of financial success for the latter.

Still, notwithstanding the restrictive effect of legislation, it is admitted that substantial progress has been made in Great Britain in the utilization of the electric current for lighting and power purposes. Exclusive of traction motors, in March of this year lamps and motors equivalent to over 14 million 8-candle lamps were connected to the mains of public supply undertakings, of which 5 millions represented the Metropolitan trade. About 300 towns had electricity supply undertakings. Exclusive of the power concerns, the public supply stations had also at this date motors amounting to 55,000-horse power connected to their mains. The tendency of modern practice is decidedly towards direct current three-wire systems, beyond which there does not appear to be any open prospect. The general raising of the voltage, with its result of extending the service area, is the main cause of this. Though for the moment the efficiency of carbon incandescent lamps, and in certain cases arc lamps, suffers from the higher voltage, Mr. Gray holds that the change has been beneficial both to suppliers and supplied. On the subject of the method of charging for current, Mr. Gray limited himself to pointing out that the maximum-demand system alone is in diminishing use, while in combination with other systems it is growing. He still thinks there is room for improvement in carbon incandescent lamps, and places it upon record that 16-candle lamps for 200 volts and upwards, with a life of 1000 hours at an average consumption per candle of even 4 volts, can hardly be obtained as a commercial article. This dictum ought to be sufficient warrant for the choice of these data by gas engineers for the purpose of comparing electric light with gas.

Mr. Gray had some weighty remarks to make upon the choice of steam and electrical machinery for central stations. He pointed out that in the early days, when the range of possible distribution was limited, central stations had to be put down in the midst of crowded and expensive districts. Space was economized by the use of high-speed reciprocating engines and water-tube boilers. To-day the units are larger, and the range of possible distribution is increased. "It is not, therefore, so necessary to follow the old practice; and in many cases to do so is inadvisable." This is another way of saying that old plant is antiquated. Turbo-generators are replacing reciprocating steam-engines for the greatest units, and the largest of all are being adapted to gas power. The Société Cockerill, of Seraing, expect to show at the St. Louis Exhibition next year a gas-engine of 3000-horse power. It is reported that the Gasmotoren Fabrik Deutz is designing a 6000-horse power engine.

Mr. W. A. Chamen's Inaugural Address as Chairman of the Glasgow Local Section of the Institution of Electrical Engineers also referred to the turbo-generator and gas-engines. As regards the former class of generating plant, it is considered to be so successful in the larger sizes that there is a probability of its being adopted before long by the Corporation of Glasgow for general electricity supply. The Clyde Valley Electric Power Company are relying exclusively upon these generators. Speaking of gas-engines, Mr. Chamen stated that the present position appears to be that the capital cost of a gas-engine, dynamo, and producer plant is considerably greater than the cost of steam dynamos and boilers, and is far greater than that of steam turbo-generators and boilers. This was referred to the comparatively low speed of gas-engines, and to the fact that in the largest sizes it does not appear to be possible to construct them in the vertical style. When it is remembered that the cost of fuel alone per unit delivered to the consumer on such a load as that of Glasgow is only ¼d. out of a total of 2·94d., it is clear that saving of fuel is not of much importance if it entails any increase in the standing charges. In moving a vote of thanks to Mr. Chamen, Mr. H. A. Mavor touched upon the gas-engine question, saying that the total cost of a complete power equipment of steam plant is about £10 to £11 per horse power, whereas the price of the best gas-engines alone, without the necessary accessory plant, is about as much as this figure. Mr. Gerald Stoney, in an address to the Newcastle Section of the Institution, also spoke highly of the Parsons steam-turbine as regards low cost, small steam consumption, and other advantages. According to these witnesses, the turbo-generator has given steam power a fresh lease of life, and imposed severe competition on the gas-engine.

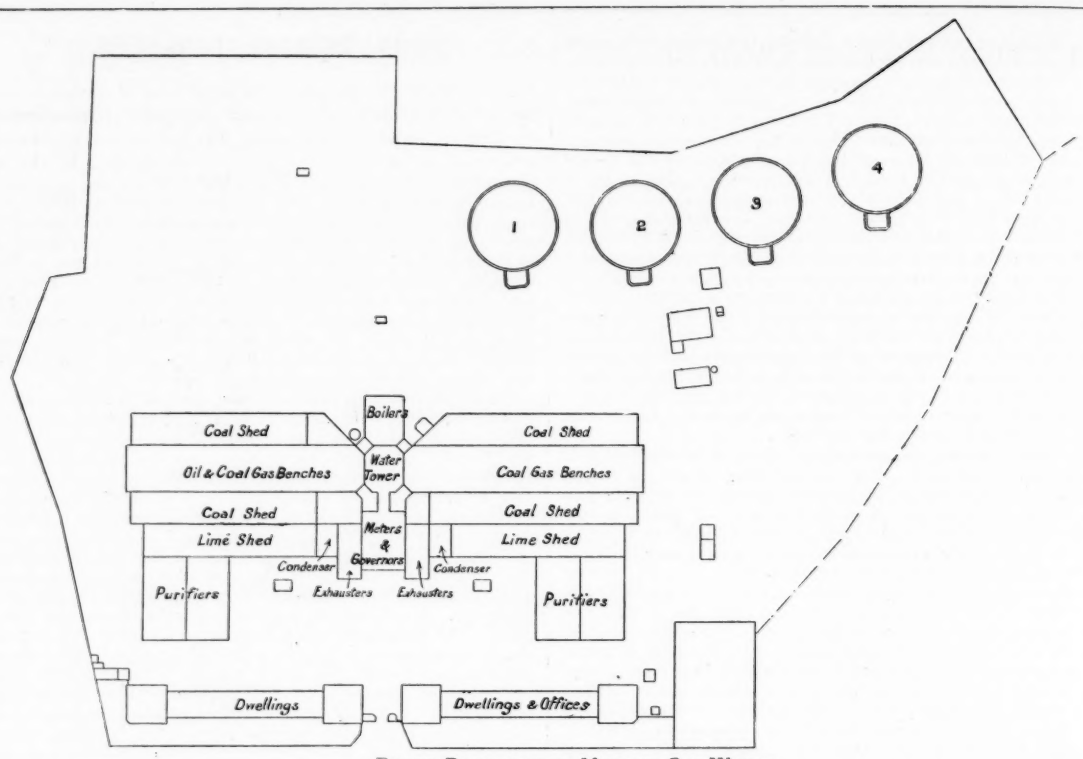
IN RUSSIAN DARKNESS.

After suffering (or enjoying) the experience of having a copy of the "Pall Mall Gazette" and of "Pick-Me-Up" confiscated on the Russian frontier; of learning that the celebrated slowness of some of London's southern trains is out-rivalled by the snail-like speed of the Russian trains, which average anything between 15 and 25 miles an hour, with stoppages at railway stations varying between 10 and 45 minutes; and of finding that the cars are good and commodious, but that the rails are very light, which necessitate the heavy trains running in a manner not to imperil them and the passengers—Mr. J. T. Westcott, of the Economical Gas Apparatus Construction Company, Limited, not long since found himself in Moscow. He was there on business intent, and, being so far afield, he made a little detour on his homeward journey, in order to extend his knowledge of gas affairs in Russia and other Continental countries.

However, it was in Moscow—magnificent in its largeness and its fine buildings—that Mr. Westcott first commenced his observations in Russia from a professional point of view. It is only about a year or so ago that he was reporting on lighting matters for a district in Pennsylvania, containing a population of 150,000; and the reason for his appearance in Moscow was an engagement to perform a similar duty there for the Corporation. The time is not far hence when the Municipality will be taking over the gas undertaking, owing to the expiration of the concession; and so they wanted a report as to the condition of the present works, and advice as to remodelling them, and upon lighting matters generally. Mr. Westcott was the Engineer chosen for this purpose. The gas-works were erected some thirty-five years ago; and the concession is held by a French Company, but with its expiration approaching, the works are not in the condition now that they would otherwise be in. This has mostly been, and will mostly continue to be, an inseparable effect of the concession system, where there is no prolongation beyond the specified term. In the latter years, too, under these conditions, pusillanimity naturally replaces any former energy in the matter of business development, as there is nothing to encourage the building up of a consumption beyond the scope of the existing works. Something of this kind, we take it, may account for the position in which Mr. Westcott discovered the gas-works and the gas business on his arrival in Moscow; for with a city of above a million of inhabitants, he only found a consumption of 600 million cubic feet of gas a year. The change in ownership will be epochal in the history of the gas supply of the city, as the Municipality will have every reason for cultivating the consumption; and they are looking into things betimes by contemplating now the remodelling and doubling of the capacity of the existing works. It was not part of the reference to Mr. Westcott to investigate the commercial part of the business in the past; his duties were confined to the present state of the manufacturing plant and the future.

The works in Moscow are totally different from what one is accustomed to see in this country, owing to the extreme cold; but they did not appear so strange to Mr. Westcott as they would have done to an Englishman with only home experience. His thoughts on seeing the works in the Great Russian city naturally turned to those with which he had been intimately acquainted, in his early professional days, in Canada and the North-Western part of the United States, where the climate is at times equally as cold, and the falls of snow as heavy. All the manufacturing plant in the Moscow works is situated under what is practically the same roof, each section being simply partitioned off from the others. The shape of the building is rectangular, with a wing at each end in the front. In the wings are located the purifiers. The total length of the house, in which is comprised this complete gas-works save the gasholders, is 660 feet; and the main portion of the building, containing the coal-stores, retort-benches, and lime-sheds, about 180 feet wide, or, including the projecting purifying-houses, 280 feet. These are each superficially about 110 ft. by 105 ft. Mr. Westcott has prepared a plan (p. 468) of this, to English gas practitioners, unique style of gas-works construction; and this will enable the arrangement to be clearly seen.

On the right hand and the left of the centre, the corresponding portions of the building are set apart for precisely similar work and objects. Commencing with the part of the building at the top of the plan, there is first the coal-store running nearly the full length, then the retort-benches, the lime-sheds, purifiers, condensers, and rotary scrubbers. In the centre, there are located the boilers, a large boiler tank, meter, governors, exhausters, &c., and there is also a room fitted up as a chapel, with candles and pictures of the patron saint, so that the workmen may attend to their devotions at any time their consciences may so dictate. The coal retort-beds are for the most part situated in the section devoted to production on the right-hand side of the centre, with a little supplementary installation on the left-hand side. Altogether there are sixteen regenerative settings of nines, and 32 ordinary direct-fired settings of sixes—all of ⌂ section. On the left-hand side, in addition to the bed of coal-gas retorts, there is a small bench of cast-iron oil-gas retorts; and this gas, which is made from Russian oil, is used for enrichment. A little removed from this large conglomeration of plant on a comparatively small space stand four gasholders, each in its own round house of brick walls and slated roof, and all warmed with steam to prevent the temperature falling to the freezing-point. The workmen's houses are a short distance



BLOCK PLAN OF THE MOSCOW GAS-WORKS.

away on the opposite side of the main building. They are built in two sections, each having its own roof.

This broadly describes the plan upon which the Moscow Gas-Works are laid out; but, of course, we cannot expect nor ask Mr. Westcott to enter with greater detail into the matters upon which he was engaged to report, and the same applies to his proposals (which are subject to the future consideration and acceptance of the Municipality) for modernizing the works, and increasing their capacity. The statement must suffice that his scheme has been propounded for the raising of the works to a high level of efficiency and capacity for meeting future business; and it even incorporates such comparatively modern appliances as conveyors.

From the particular, we must descend to the general, by giving expression to a few of Mr. Westcott's impressions in continuing his journey. From Moscow, he proceeded to Saratov on the Volga. Here he found a city of no less than 140,000 inhabitants, and many fine buildings, without any general scheme of lighting. There are some private electrical and gas installations; but at an early date the city authorities propose—over a century after the birth of gas lighting!—to lay down either gas or electric lighting works; the question even now being left to the decision of a popular vote, which is to be taken very shortly. It will also come as a matter of surprise to many to learn from Mr. Westcott that in Russia, with its (something like) 129 millions of people, there are only about sixteen gas-works; and these are far inferior in character to anything that is now recognized in gas engineering practice in near Continental countries, in Great Britain, or in America. Some of them manufacture coal gas only, others oil gas, and others again both coal and oil gas. The oil-gas plants are, as a rule, of the retort type; but, in one or two works, Dr. Strache's water-gas system is found. In most of the towns, the public lighting is poor; and generally, both for public and private purposes, oil lighting is, of course, the fashion. So far as Mr. Westcott's observations went, the street lighting of Moscow was about the best to be found; and there it was a mixture of incandescent gas-lamps, electric arc lamps, with a few instances of the Ganz system. Outside the main thoroughfares of the large towns, the lighting is of a contemptible character. So far, however, as Moscow is concerned, the scheme of modernization at the gas-works, when they pass into the possession of the Municipality, will no doubt be accompanied by the improvement of the public lighting. Besides the general use of oil for lighting, it is very extensively employed for use as fuel for locomotives, steamships, and engineering works.

Brief as this sketch is, in the circumstance of the visit of Mr. Westcott being of a professional nature, it is of interest. In the past, we have had little light thrown on to the conditions of gas supply in Russia. That the country was somewhat benighted in the matter of artificial lighting was generally known; but this sketch strengthens the appreciation of the condition of things that actually exists. It is quite manifest that at the present juncture, with sixteen gas-works of various kinds covering something like one-sixth of the land on the terrestrial globe, there is not much room for (say) gas managers' associations, or for the support of a gas journal, nor for the upkeep of gas-engineering works such as are found in these little islands of ours.

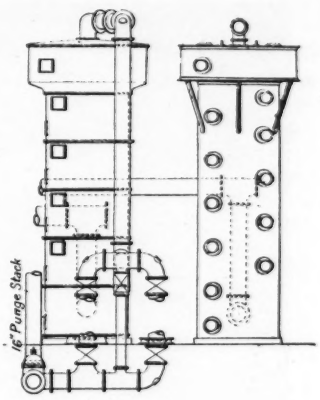
Leaving Russia and his interesting experiences there behind him, Mr. Westcott took advantage of his opportunity and passed through other Continental countries. Generally speaking, he found gas affairs there in an equally flourishing condition to, and in some cases even more so than, other branches of trade. In Germany, he saw that several new coal-gas installations have been made of late years, and that a number of works have been extended and remodelled. One matter of special interest to which his attention was directed was a new gas-producer of the Gasmotoren Fabrik Deutz, of Cologne, which was spoken of in very favourable terms; and so great is the faith of the Company in it that they have, he understands, enlarged their capital specially to exploit it. This is the gas-producer that was described in our "Register of Patents" on Sept. 8, 1903; and it has been designed specially for the generation of gas for motive purposes. The salient variation between it and other producers is that the top is open. From this opening air is passed in downwards through the fuel; and steam is passed in at the bottom, rising upwards. Both currents pass out together by channels in the sides of the producer midway in the depth of the fuel; the gradual current of air and steam being maintained by the vacuum formed. Mr. Westcott has not had an opportunity of testing this producer; but the idea strongly commends itself to him.

The notes which form the foundation of this article are the sum and substance of an entertaining conversation with Mr. Westcott on his return from his Continental wanderings; and though it is merely an outline narrative of what he saw and learnt, it will, we are sure, afford interest to many readers.

The Manchester District Institution of Gas Engineers will, as already announced, hold their 136th quarterly meeting at Halifax next Saturday, under the presidency of Mr. S. R. Ogden. On arrival, the members will be taken in brakes to the gas-works, after an inspection of which luncheon will be served at the White Swan Hotel, where the meeting will subsequently be held. The business includes the reading and discussion of two papers—one on "Internal Fittings," by Mr. A. E. Mottram, of Ossett; the other on "Incandescent Lighting," by Mr. S. Meunier, of Stockport. After the meeting, there will be tea, as usual.

Use of Tar in Street Paving.—It appears that the comparatively new style of street paving with macadam, in which the stones are coated with tar, has been used with success in the city of Hamilton, Canada, and 8 miles 1200 yards have been laid at a cost of £29,000. The kerbing is of portland cement concrete. The top surface of the road is finished with clean gravel, two gallons of tar being mixed with each cubic yard. The whole is thoroughly rolled. No repairs have been made on any of the pavements laid within the last three years. The advantages claimed for this class of pavement may be summed up as follows: Economy in construction, the average price for 1901, with labour at 9d. per hour, being 4s. 5d. per square yard; good foothold for horses; and absence of dust. With regard to the last-named advantage, it may be mentioned that, for the prevention of dust and mud, permission has been given to tar the Avenue de la Grande Armée, in Paris, at a cost of about £50.

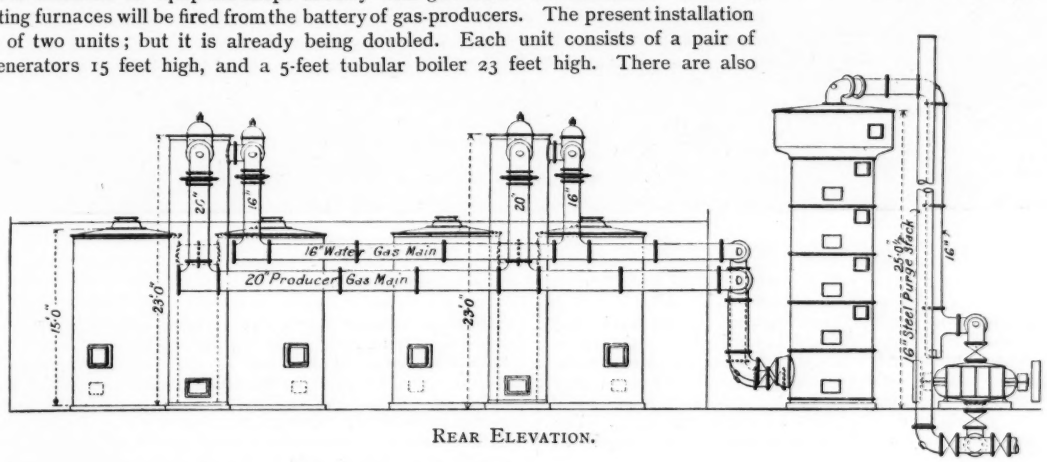
A MODERN AMERICAN POWER AND FUEL GAS PLANT.



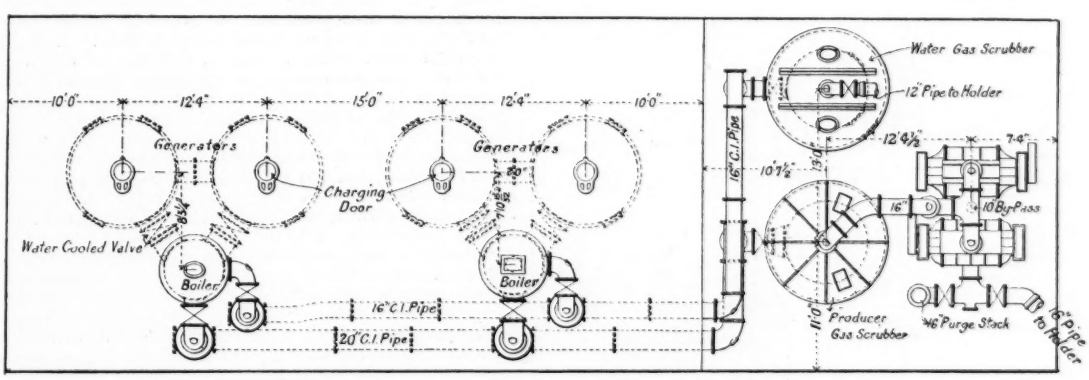
FRONT ELEVATION.

THE accompanying illustrations, taken from the "Engineering Record," show the general arrangement of a combined water-gas and producer-gas plant of the Loomis-Pettibone type, at the bridge works of the Pennsylvania Steel Company. The installation is interesting for several reasons. It goes to prove that there is work for gases of different descriptions in the most advanced industrial establishments of the kind; and it is a pleasant memorial to the perseverance of one inventor, Mr. Burdett Loomis, whose devotion to the cause of making producer gas from bituminous coals was recognized in the "JOURNAL" many years ago. Indeed, it is a long time since we heard any news of Mr. Loomis, whose efforts to base certain manufacturing processes, such as saw-making, on his producer-gas system were not crowned with success. The idea was apparently rather top-heavy. To make gaseous firing the foundation of a branch of industry, is to ask too much of it. The gas-furnace is calculated to be a useful servant in its place; but it cannot do everything.

At the particular works in question, every form of power is employed for various purposes considered to be most suitable. Certain machine tools are electrically driven; and so are the hydraulic power pumps. Compressed air is used for the riveting machines, at 100 lbs. pressure. It is intended to equip the shops entirely with gas-heated rivet furnaces. All rivet and heating furnaces will be fired from the battery of gas-producers. The present installation consists of two units; but it is already being doubled. Each unit consists of a pair of 9-feet generators 15 feet high, and a 5-feet tubular boiler 23 feet high. There are also



REAR ELEVATION.



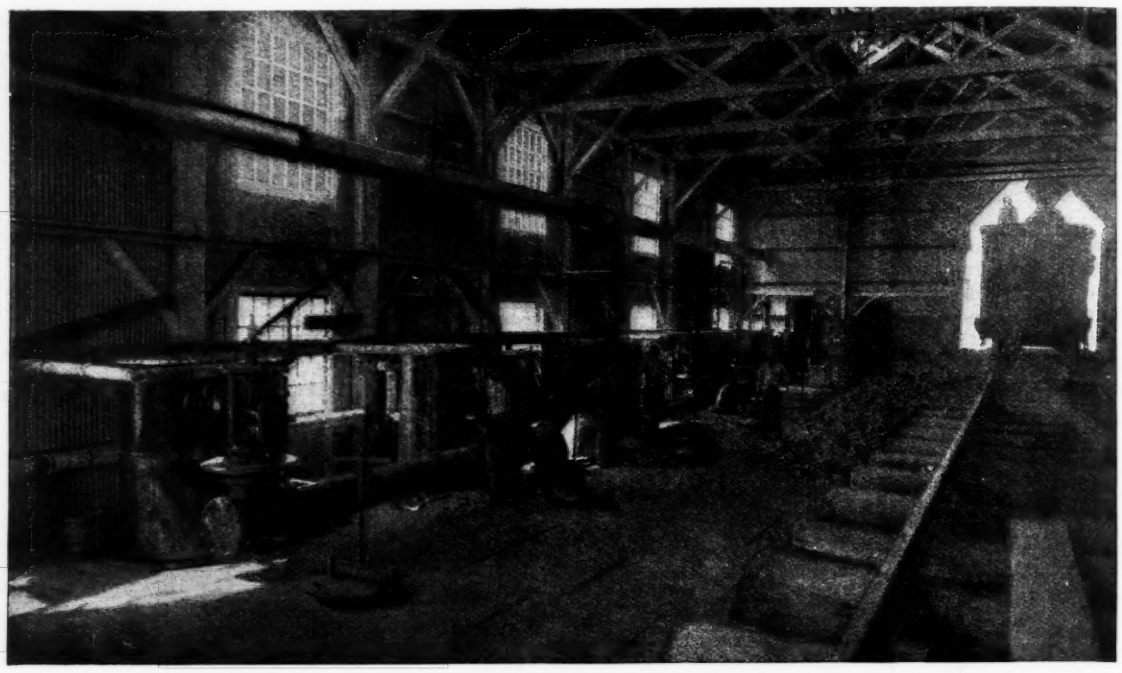
PLAN.

FUEL PRODUCING PLANT OF THE PENNSYLVANIA STEEL COMPANY (LOOMIS-PETTIBONE SYSTEM).

two 7-feet scrubbers, 26 feet high, one for the water gas and the other for the producer gas. The plant is run continuously, and is capable of gasifying 24 tons of bituminous coal every 24 hours. The working staff consists of a foreman and three labourers, for 1½ hours every alternate day. The boiler, generators, and holders are connected by pipes which are controlled by valves with hydraulic pistons. In operation, the producers take both their fuel and air from the top. This down-draught plan of gasification always was the main principle of the system of Mr. Loomis. He claims several highly important and desirable results from it, going so far as to say that it is the only way to gradually gasify raw bituminous coal and make a clean gaseous product. The charge of fuel is distilled at first, and all the gases have to pass through the bed of incandescent fuel; which is not the case with any other system of gasification.

The induced downward draught is caused by an exhauster placed immediately after the scrubber, as shown. The producer gas thus made goes directly to the gasholder. When the fuel is ready, the exhaust valve is shut and steam is turned into the ash-pit to make water gas, in the usual way, going into its own holder. Both producer and water gas go through the vertical boiler; their sensible heat generating the steam required. The water gas is made from both producers in the unit; the steam passing up through one and down through the other, which effectually fixes it. There is consequently no tar, and the percentage of condensable water vapour in the water gas is very small. In operation, the plant yields about three volumes of producer gas to one volume of water gas; and these gases are mixed in the required proportions for use in different processes in the works. The water gas has from 325 to 350 B.T.U. per cubic foot, and the producer gas from 100 to 120 B.T.U. per cubic foot. Some 40,000 cubic feet of the water gas are made from one ton of bituminous coal. The water gas is used where a high intensity of heat is required, as for forging, welding, upsetting, and rivet making. The blended gases answer well for low-temperature work, as for bending and annealing. In the bridge shops there are furnaces for heating angles and plates to be bent, and for heating rivets; and in the frog, switch, and signal department there is a large forging shop, in all of which fuel gas will be used, both mixed and unmixed as desired.

The whole arrangement is so simple that no further description of it is required. Of course, the generators are supplied with fuel mechanically, and the clinkering is done with the least possible amount of loss and labour. But all the accessories have been kept out of the illustration in order to preserve the important elements in their essential simplicity. In short, the whole plant is exhibited diagrammatically; but it is easy to appreciate the value of the combination. Those gas engineers and others who are thinking about power and fuel gas plants will be well advised to give heed to this combination, the merits of which are by no means small. Indeed, it is hardly too much to say that the Loomis-Pettibone device will be more heard of in the future.

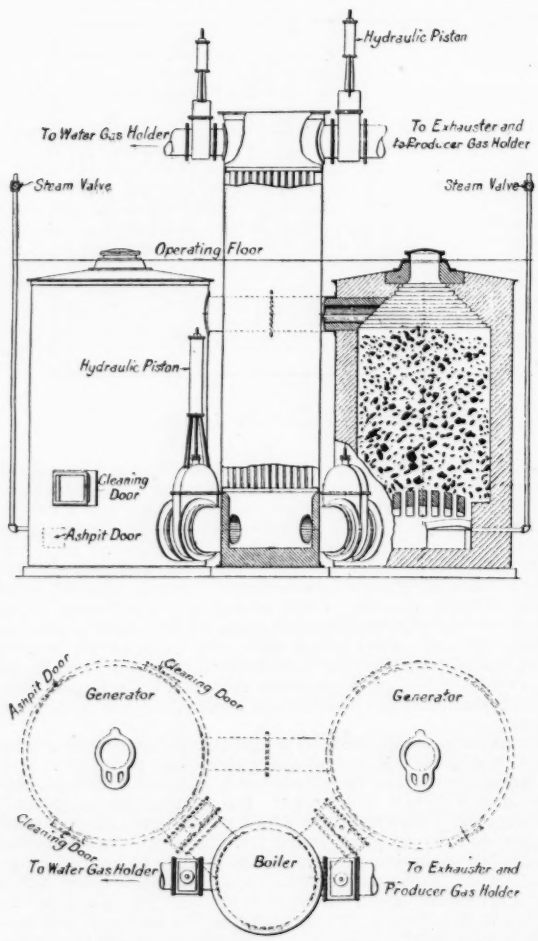


Interior of the Gas Plant of the National Tube Works, Middletown, Pa.

[Showing Six Generators, or One-Third of the Plant.]

It is a strong point in the designers' favour that, in producing their gas, they pass everything through the fire, which must make a clean product. One would think, also, from their employment of an exhauster (which could, of course, be driven from a gas-engine) that they prefer to generate their producer gas rather slowly. This would allow the dust to settle out of it. The absence of tarry impurity would be an enormous advantage. In gas-works a certain proportion of tarry coke and breeze might be added to the charge in such a plant.

The down-draught principle of working has much to recommend it, especially if the generators are big enough to avoid the arching-up of the charge. Another strong point is the employment of gasholders. No important producer and water gas plant can be worked economically without a certain amount of storage capacity—not necessarily large, but sufficient. It is one of the advantages of such plant that the stand-by losses are small, so that there is no necessity to have large holders. With a plant of the design under notice, moreover, it should be easy to arrange for the best possible working of the system devised by Frederick Siemens, of passing a portion of the producer gas through the fire again, with the object of reducing the proportion of carbon dioxide. It is understood that the theoretical advantage of this process was not realized in practice by the generators to which it was applied; but the possibility of economizing in this way remains. Generally speaking, moreover, the facilities offered by this plant for making both producer and water gas in any desired relative proportions up to the ratio mentioned, from the cheapest description of fuel, should be its strongest recommendation. All that is needed to prove the economy of the combination would appear to be a sufficiently profitable use for the producer gas. This demand was formerly lacking; but now that the product can be advantageously used in gas-engines, the only drawback to the commercial value of such a plant would seem to be removed.



A Pair of Generators and Boiler.

A FRENCH VIEW OF LAST YEAR'S DÜSSELDORF EXHIBITION.

Those of our readers who have followed the records of the proceedings of the Société Technique du Gaz en France which have from time to time appeared in our columns will doubtless remember that it has been the custom of the Committee to send a delegate to take note of, and report upon, any matters of interest to the gas industry at large to be found at any important exhibition, in order that some particulars in regard thereto might be found in the archives of the Society. The gentleman selected for this responsible duty has been M. Adolphe Bouvier, of Lyons, whose name has frequently come before our readers as the author of valuable papers presented at the annual congresses. On the occasion of the Industrial Exhibition in Berlin in 1896, he submitted a very interesting report on the gas exhibits; and last year he critically examined those displayed at the Düsseldorf Exhibition. It will be recollected that the German Association of Gas and Water Engineers arranged to hold their congress in the last-named place during the period of the Exhibition; and this afforded M. Bouvier an opportunity of combining with his notes on the appliances an epitome of the proceedings at the meetings of his German colleagues. The whole report has lately been issued as a pamphlet,* with copies of which we have been

* "Le Gaz à l'Exposition de Düsseldorf en 1902, et le Quarante-Deuxième Congrès du Gaz en Allemagne." Rapport par M. Ad. Bouvier. Paris: Bureau de la Société Technique; 1903.

favoured by the author. The principal technical matters brought forward at the congress have already been dealt with in the "JOURNAL;" and therefore the first section of the report does not call for notice. An indication may, however, be given of the scope of the second; though the Exhibition and all connected with it has passed into history.

The author gives first a short account of the origin of the Exhibition and its chief object—viz., to convey to the visitors some idea of the industrial and metallurgic capacity of Westphalia. He then passes on to notice the exhibits. The general arrangement of the plant used in the manufacture of gas was shown by plans and drawings of the works at Düsseldorf and Essen; while models of inclined retorts on the Coze system were exhibited by the Stettin Company. The Cologne-Bayenthal works sent a good collection of plant, conspicuous among which were the Marcus coke-conveyor, a gas-engine of 700-horse power to be driven by blast-furnace gas, and a complete installation of plant for making poor gas at the rate of 53,000 cubic feet per hour. Another good show was made by the firm of Pohlig, of Cologne, of overhead and other conveyors. Special mention is made by M. Bouvier of the coke quencher and conveyor of M. Merz, the Manager of the gas-works at Cassel, which was described and illustrated in the "JOURNAL" for July 1 last year. The other portions of plant on view are only briefly noticed. There was a fine show of gas cooking and heating appliances at the Exhibition; the house of Junkers, of Dessau, who have a branch establishment at Rheydt, having several varieties of bath-heaters and other apparatus. The radiators of this firm need not necessarily be placed upon the floor or in a fireplace, but may be affixed to the wall of an apartment at any height desired. The house of Houben, of Aix-la-Chapelle also showed radiating and reflector gas-stoves and bath-heaters. All the examples of gas cooking-stoves appear to have been satisfactory. There was nothing special to notice in the way of meters or fittings.

Gas-engines figured conspicuously at the Exhibition; and, as might be expected, the celebrated Deutz establishment was well represented. In these works a capital of 15 million marks (about £750,000) has been invested; they employ 2150 hands, and turn out annually 2000 engines, furnishing a total of about 20,000-horse power. A large portion of the report is devoted to the productions of this great factory, of which there were 32 examples, all at work in a special pavilion; while in an adjoining one was a fine four-cylinder Otto engine of 1000 to 1200 horse power, working at 120 to 125 revolutions per minute with a fly-wheel weighing 20 tons. It was arranged for being driven by purified blast-furnace gas; and M. Bouvier emphasizes the growing use of engines of this class for driving dynamos—one of 1000-horse power having been installed at Hoerde, in Westphalia. He discusses the relative merits of steam and gas, and gives some practical comparisons between the cost of motive power produced by poor gas, electricity, and steam; the conclusion being in favour of gas. The Oechelhaeuser, Körting, and other engines are duly noticed; and then M. Bouvier devotes a chapter to the gas-generators shown

Among the exhibits bearing upon the gas industry, M. Bouvier gives considerable attention to the full-sized Otto-Hilgenstock coke-oven constructed for five or six chambers, which was on view, and in regard to which Herr Hilgenstock read a paper at the congress. These ovens, which are heated by coal gas, were described in the abstract of the paper which appeared in the "JOURNAL" about this time last year. Another interesting exhibit was the instrument devised by M. Arndt for measuring and registering automatically, at regular intervals, the quantity of carbonic acid in combustible gases. It has already been described in our "Register of Patents." As may be remembered, it furnishes a ready means of controlling the heats, and enables a strict watch to be kept over the stokers, so that economical carbonization may be ensured.

The author could not part with the Exhibition without a few words on the lighting. This was done by 1000 arc and 4000 incandescent lamps; the total area illuminated being 530,000 square metres, of which 180,000 were covered. The current was of various kinds—continuous, three-phase, and single-phase; and it was produced by generators worked by steam, ordinary gas, and poor gas. There were 24 boilers, having a heating surface of 4600 square metres; and three were worked with lignite. In most cases, the dynamos were coupled direct to the engines. Gas was not excluded from the Exhibition, the "Millennium" system of intensified lighting being employed in one of the pavilions; and it competed well with the electric arc lamps.

On the whole, M. Bouvier has produced an interesting pamphlet, consisting of 212 pages of matter, which is illustrated where necessary, and there are also five plates.

Proposed Amendment of the Workmen's Compensation Acts.—A Departmental Committee, appointed by the Home Secretary, is now engaged in considering what amendments in the law relating to compensation for injuries to workmen are necessary or desirable, and to what classes of employments not included in the Workmen's Compensation Acts, those Acts can properly be extended with or without modification. The Committee consists of Sir Kenelm Digby, K.C.B., his Honour Judge Lumley Smith, Sir Benjamin Browne, D.C.L., M.Inst.C.E., Captain A. J. G. Chalmers, and Mr. G. N. Barnes. Mr. R. R. Bannatyne, of the Home Office, is Secretary.

THE MANUFACTURE OF SULPHURIC ACID.

A BRIEF notice of the last edition of Dr. Lunge's exhaustive treatise on the above subject appeared in our columns last week.* It is now proposed to give a more detailed consideration of the general scope of the work, which is divided into fourteen chapters of varying length, in proportion to the importance of the subject-matter.

Starting with a brief introduction, a short history of the manufacture of sulphuric acid is given, together with the general principles underlying its production. Then follows a description of the raw materials in general use, their sources of origin, and the best methods for their valuation and analyses. Statistics are also given as to the respective quantities of the various available raw materials derived from different sources, as well as their composition. This important chapter covers some 144 pages, and contains much very interesting and valuable matter, including a full description of the manufacture of nitric acid and of the composition of commercial nitrates. Chapter III. is directed to the properties and analysis of the oxides and acids of sulphur; while Chapter IV. deals entirely with the production of sulphur dioxide. An elaborate description is given of various means employed for burning the different materials, taking into consideration composition and physical condition.

Chapter V. gives full details of the construction of the lead chambers; while Chapters VI. and VII. are devoted to the recovery of the nitrogen compounds, and to full details of the practical working of the chamber process, and of the various theoretical aspects of the reactions involved. This leads us by natural stages to the purification and concentration of sulphuric acid, and to the general arrangement of works on the chamber plan, with statistics of yields and costs. Then follows a description of the method employed in manufacturing Nordhausen or fuming oil of vitriol and of sulphuric anhydride, and special chapters on other processes of manufacturing sulphuric acid, and on the utilization of bye-products. An account of the many applications of sulphuric acid, and statistics and general addenda up to August, 1903, with an elaborate index, completes the work.

Although a large part of the book is of such a highly technical nature, and of such a comprehensive character, as to be beyond the requirements of any but an exclusive sulphuric acid manufacturer, yet its acquisition would be of the greatest benefit to all those even indirectly concerned in the production of sulphuric acid—such as many of those who have charge of the larger gas-works, where bye-products are utilized. Gas-works would seem indeed peculiarly well situated for the manufacture of limited quantities of sulphuric acid by the conversion of a large proportion of the sulphur of their coal into acid, for combination with the bye-product ammonia to form sulphate of ammonia.

Those interested will find much of value in the descriptions with regard to the treatment and utilization of spent oxide and sulphuretted hydrogen for sulphuric acid manufacture. Under "Raw Materials" (p. 85), the use of spent oxide is mentioned. The analysis of the samples given are, however, not representative, as they are stated to have been derived from the so-called artificial oxide of iron (mixtures of hydrated oxide and sawdust) in contradistinction to the different varieties of native bog ore mostly in use in this country. Out of eight series of analyses given, only one is from bog ore; and the figures show from 9·7 to 11·4 per cent. of insoluble matter. In three ordinary analyses (Davis), the proportions of insoluble matters are 11, 5, and 8·3 per cent.; while in two cases calcium carbonate is given at 3 and 5·1 per cent., and in another 2·3 per cent. of calcium sulphide. In spite of evidences of inferior raw material and somewhat careless handling, the proportion of sulphur is from 62 to 67 per cent. A spent residue, after burning, is credited with the presence of no less than 13·3 per cent. of calcium sulphate.

Professor Lunge is correct in emphasizing the fact that if any free lime is present in spent oxide, it will fix a proportional quantity of the sulphur present on burning. For the analyses of spent oxide for available sulphur, combustion in a current of oxygen is recommended; the sulphur dioxide produced being oxidized by bromine water. The sulphuric acid formed is estimated by barium chloride in the usual way. The same process is recommended for the analysis of the material after burning. Professor Lunge strongly recommends the washing of spent oxides before burning to eliminate salts of ammonia, &c., which are valuable in themselves, but have a prejudicial effect in combustion. It appears that in the use of the better classes of pyrites for the manufacture of sulphuric acid, the residue after combustion contains, in most cases, a minimum of about 3 per cent. of sulphur. No statistics are given with regard to spent oxide; nor have we ever seen any. It would be interesting to know if this detail receives any attention on gas-works where oxide is used.

The subject of the best method of burning spent oxide is dealt with on page 366 *et sequitur*. Professor Lunge states that this is sometimes accomplished by the use of ordinary brimstone burners; but he does not recommend this course of procedure, as complete combustion is difficult, and there is a loss of sulphur in the "cinders." A form of shelf burner is generally employed,

* "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches." By George Lunge, Ph.D. Vol. I., Parts 1 and 2. London: Gurney and Jackson; 1903.

of which a typical form (Hill's burner) is illustrated. Professor Lunge gives some useful comments on the proper conditions of the combustion of pyrites, but little especially about oxide. The sources of difficulty may be similar in both cases. The greatest error arises from an inefficient air supply, and from the employment of too much heat. In both cases the sulphur is more or less volatilized and lost. In the case of the air supply being too limited, "slags" or "scars" are formed on the burning material, from the formation of iron monosulphide (Fe S). This, being readily fusible, forms masses with the unacted-on material, and thus not only leads to loss of sulphur, but increases the evil by interfering with the regularity of the distribution of the air supply.

With regard to sulphuretted hydrogen, he recommends its combustion with a proper air supply, in a brick chamber provided with baffle walls. A small furnace is provided for maintaining combustion; but when once started, this is unnecessary, as the heat of the mass of brickwork is constantly maintained by the burning gas. It is pointed out that it is difficult to manufacture sulphuric acid from the combustion of sulphuretted hydrogen largely diluted with carbonic acid, as is the case in the gases from sulphate of ammonia works; but this difficulty does not occur when the combustion products from these gases are mixed with those from the burning of sulphur, and no complication occurs in the subsequent chamber treatment.

One important consideration must not be omitted—viz., that the acid produced from the combustion of spent oxide and from sulphuretted hydrogen, is, in both cases, practically free from arsenic. This not only renders such acid available for many purposes for which pyrites acid is unsuitable, but also enables a practically white sulphate of ammonia to be produced, which should command, *cæteris paribus*, the highest market value.

In the course of Professor Lunge's work, every detail of cost and management is given, with clear and profuse illustrations. To those wishing to enlarge their knowledge of the present state of sulphuric acid manufacture, the careful study of his book will amply repay the necessary time and attention.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 487.)

The volume of business effectuated last week on the Stock Exchange again proved to be decidedly slender; but it made up in quality what it lacked in quantity. The removal of apprehension as to a tightening of money and an improvement in the position at New York imparted quite a feeling of cheerfulness. Prices at once began to rise, and the public, as usual, came into buy when prices are rising against them; so there was a nice advance all round, with Consols at the head of the movement. And this lasted right up to the close. In the Money Market, there was marked relief; and the rates for short loans and discounts were nice and easy. Business in the Gas Market was unusually lively; the volume of transactions (especially in one issue which had been quiescent for some time) being far in advance of recent averages. The general tendency, too, was extraordinarily steady; there being only one small change in the London list of quotations. In Gaslight and Coke issues, there was a fair amount of dealings in the ordinary at almost exactly the same figures as those marked in the preceding week; the lowest being 85⅛, and the highest 86. Transactions in the secured issues were only moderate; but prices were generally well up to, or in advance of, middle figures. South Metropolitan was much more active than it had been for weeks past; and after making 118⅛ once, it left that price behind, and rose to 120⅛—the quotations marking a rise of a point. Dealings in Commercials were more numerous; but the figures marked were not of the best—there being apparently a dearth of buyers. In the Suburban and Provincial group, there was hardly a transaction in London, and there was no movement. But in the Provincial exchanges, slight variations in the quotations of Liverpool "A" and Newcastle were effected. Outside the Stock Exchange, the event of the week was the issue of £85,000 5 per cent. preference stock by the West Ham Company, at prices ranging from 110 to 115 per cent. In the Continental Companies, the chief feature was the remarkable activity of Imperial; the array of dealings in which dwarfed all the rest. It marked 199⅛ once; but the greater number of bargains were at or over 201. European and Union were not dealt in. There was nothing in connection with the remoter undertakings to call for notice. In the Water Companies, business was more active; and there was a decided recovery in some of the ordinary stocks—East London and West Middlesex being conspicuous in this respect; but at the same time there was quite a tendency to reduce the values of secured issues.

The daily operations, being at a uniform level, need no further detail. The only change in Gas—a rise of 1 in South Metropolitan—was on Wednesday. The changes in Water were: On Tuesday, West Middlesex rose 5, and East London 2. On Wednesday, West Middlesex gained 5 more. On Thursday, Southwark moved up 2, and East London 1½. On Friday, East London rose 5½; but Southwark debenture fell 2, and New River debenture 1. On Saturday, East London gained ½, and Southwark ordinary 3; but ditto preference receded 2.

THE TESTING OF PUBLIC STREET-LAMPS.

In view of the attention that has been drawn to the reports of tests of public street-lamps by Mr. J. W. Bradley, the City Engineer of Westminster, the veracity of which we have had occasion to impugn, it will be of interest to readers who are unacquainted with the character of the photometer with which the tests of the lights have been made, to learn something about its construction; and for this purpose Mr. William Sugg, at our request, has kindly had a sectional drawing of the instrument made. The use of the word "veracity" perhaps needs some explanation. It is not denied that, so far as the photometer and the circumstances admit, the Westminster observations have been carefully taken. What is contended is that the circumstances do not permit of the full lighting value of the Sugg high-pressure lamps in Whitehall being ascertained; and, further, that the conditions of those lamps, as was explained last week, do not allow of the tests being made on all-fours with those of the electric arc lamps. It is impossible, owing to the distance at which the readings have to be made from the high-pressure lamps, to get into the photometer-box their full lighting-power, besides which the several ribs of the lanterns used must effectually cut off a considerable amount of the lighting power from the disc. The argument has not been contested by Mr. Bradley. This explanation will show that we do not question the faithfulness of his readings so far as he is able to make them, but assert that they are vitiated by the conditions. His comparative costs, of course, being actual ones, cannot be disputed; and there is no occasion to dispute them from the gas suppliers' point of view. They are an excellent testimony to incandescent gas lighting being a cheap and efficient system for street purposes.

Sugg's Travelling Photometer, as Used in the Westminster Tests.

A. Two-Candle Pentane Standard. B. Light from Street-Lamp. C. Mirror. D. Sight-Hole.

The photometer used by Mr. Bradley is of the perambulator type, and was made by Messrs. William Sugg and Co., Limited. It can be wheeled about from lamp to lamp; and equality of light on the discs is obtained simply by moving the whole of the arrangement nearer to or farther away from the lamp under test. At the most, after what has been said about the Westminster figures, it can only be regarded as a ready means of making comparative tests of illuminating power in street-lamps which are equal in all respects; but nothing more. The section of the instrument will explain its construction. The larger of the two tower-shaped boxes forms a dark, well-ventilated chamber for a 2-candle pentane lamp. In the base of the smaller tower at the other end is a Ritchie, or ^ shaped, disc, so that the light of the lamp to be tested falls on the outer stop and the light of the pentane lamp on the inner one. At the top of the tower is a sloping mirror; and, by the aid of this, the disc can be observed through the sighting-hole shown in the illustration. The tube connecting the two towers is lined with black velvet, and is made so that it can be drawn out, in order to convert the arrangement to a 1-candle standard for testing lamps of small power; but this is rarely used. The disc is about 3 feet from the ground.

This is the instrument with which the Westminster tests have

been made; and it may, with this brief description, and previous references to Mr. Bradley's figures, be left to the judgment of readers. There are circumstances, in which it is quite possible that approximately reliable tests can be realized with this travelling photometer; but they are few and far between. Its use under conditions such as those described in connection with the Whitehall high-pressure lamps, leaves much to be desired in respect of trustworthiness. It is the conditions rather than the instrument that are at fault.

OBITUARY.

By the death of Mr. JOHN PENN, M.P., which took place at his residence in Carlton House Terrace on Saturday night, at the comparatively early age of 55, the principal member of the great marine engineering firm of Penn and Sons, Limited (now absorbed in the Thames Iron-Works and Shipbuilding Company), has been removed, and the Kent Water Company have lost a Director.

Alderman A. S. WALTERS, Chairman of the Gas and Electric Lighting Committee of the Longton Corporation, after ailing for some months, died on the 13th inst. He was also the Chairman of the Finance Committee of the Corporation, and had for some years taken great interest in the affairs of the town. The funeral took place last Tuesday, and was attended by the Mayor, Corporation, and Officials; also by members of the Etruscan Masonic Lodge, of which deceased was a prominent member.

We regret to announce the death, on the 13th inst., of Mr. RICHARD MERRELL, who for about twenty years was Manager of the Mossley Gas-Works. This position he took when the works were in the hands of a Company, and he retained it when they were acquired by the Corporation in 1885. He remained in the service of the Municipality till about six years ago, when he sent in his resignation. He joined the Gas Institute in 1882, and the Manchester District Institution in 1887; and he was a fairly regular attendant at the meetings of both bodies.

The death occurred on the 18th inst., at his residence, "Westbourne," St. Anne's-on-the-Sea, in his 55th year, of Mr. GEORGE BRINDLEY JACKSON, late a Director of the Stretford Gas Company, and for many years head of the Gas Department of the Manchester Corporation—a position which he relinquished about twenty years ago to commence business as a coal and chemical merchant in the city. Though he commenced life in quite a subordinate official capacity, he displayed great skill in the treatment of the residuals of gas manufacture, especially in the production of benzol. Deceased was a member of the St. Anne's Urban District Council.

PERSONAL.

Mr. J. DENT YOUNG, Engineer to the Bath and District High-Level Water-Works Company, has been selected by the Committee for the position of Water Engineer to the Bath Corporation, at a salary of £350. The choice was influenced by Mr. Young's local knowledge, as well as by his six months' temporary holding of the office of Acting-Engineer to the Bath Corporation.

Mr. H. C. PAGE, the Gas and Water Engineer at Canterbury, has been the recipient of some handsome presents from the Directors and employees of his Company, on the occasion of his marriage last Saturday to Miss Ethel Matthewman, of Huddersfield. On Monday of last week, the Chairman of the Company (Mr. D. Amos, J.P.) asked Mr. Page to accept from the Directors a splendid marble clock and set of dessert knives and forks, as a mark of their appreciation, and with the hope that they would be enjoyed during many happy and prosperous years by him and his bride. Mr. Page, in thanking the Directors, said that, apart from the high intrinsic value of the gifts, he greatly appreciated the goodwill which had prompted them to make the presentation. A similar pleasing function was also performed by Mr. W. A. King, Chief Clerk to the Company, at a smoking concert held by the employees; the gift in this case taking the form of a handsome tantalus. Mr. King said the fact that the present was subscribed for by every man and boy in the employ of the Company showed how Mr. Page's good qualities were appreciated. Mr. T. Rogers, an old employee of the Company, said he was pleased to be able to speak of the good feelings which had always existed between the workmen and Mr. Page. It had given him great pleasure to assist in the collection of the subscriptions. Sometimes it was difficult to get money; but in this instance it came in very readily, and every man gave what he could afford. Mr. Wood, speaking on behalf of the works men, said he hoped the good feeling which existed would always remain, and that Mr. Page would continue with them for many years. Mr. Page, in thanking the donors, said he greatly appreciated their kind words and good wishes. As Engineer to the Company, he had two duties to perform—one to the Company, and the other to the men. Sometimes his duties to the men were not of a pleasant nature; but he had always endeavoured to be just, and hoped that the good relationship which now existed would continue.

COMMUNICATED ARTICLE.

MUNICIPAL ELECTRICITY WORKS.

Attention has been directed to this subject as part of the wider question of speculative municipal trading; but its importance demands a separate investigation, in order to understand the reason why it is that the correct results of the working are not made public by many town authorities.

The idea has extensively prevailed that, when these undertakings are worked by municipalities, instead of by private companies, the ordinary methods of business and the usual financial precautions, which represent the accumulated wisdom of ages, may be safely set aside, and that practices may be introduced which would admittedly bring a private company into bankruptcy, without having a similar effect upon the municipality. There can be no greater error than to suppose that the principles underlying successful financial operations and business management can be departed from without disastrous results, whether to municipalities, companies, or individuals; and it will be found that, in spite of some apparent differences, which lie only on the surface, all enterprises of this nature, which are really successful, are governed by the same root principles. As against this statement, it has been repeatedly said that a municipality stand on a different basis, because they are compelled to clear off the amount borrowed as capital within a given time; but this argument is quite fallacious, as the highly trained and experienced Civil Servants of the Crown only compel the municipality to do that which scientific finance would lead everyone to do who invested his capital in such undertakings.

To illustrate the subject, it is only necessary to introduce the hypothetical landlord and the hypothetical tenant, who play such important parts in the questions of rating assessments which so frequently come before the Courts; and it will then be seen that, whether the capital be provided by a municipality or by an ordinary landlord, the principles upon which each would or should act are precisely the same. In the case of a landlord erecting one of these great buildings for use in generating electricity, fitting it with choice machinery, and letting it to a tenant, the least rent that he would be content with in such a speculative undertaking must be sufficient to pay him 5 per cent. upon the capital expended. If, further, it were part of the agreement between landlord and tenant that the former should replace the machinery whenever it became worn out or obsolete, he would not be content with a less rental than would suffice to bring him in 8 per cent. upon his capital—that is to say, 3 per cent. to be set aside yearly for replacing the machinery and 5 per cent. for interest, which would be very moderate under such circumstances. The landlord, if guided by scientific finance, would deal with this interest by taking 3 per cent. (the amount he would receive from a gilt-edged security) as fairly belonging to his annual income. The remaining 2 per cent. he would invest to accumulate with interest and compound interest, to recover his capital, which he stands to lose in an undertaking having so many elements of risk; and the amount so set aside would repay him the whole of his capital in about 31 years, if the concern continued solvent so long. This, in principle, is precisely what the Local Government Board compel municipalities to do, only varying the details as to time a little up or down according to circumstances. This principle once grasped, a host of arguments raised upon different points will appear in their true character. It has been repeatedly argued that municipalities need not provide a depreciation fund, because they have a sinking fund for paying off borrowed capital. But it is clear from the foregoing statement that the two funds have nothing in common; and, what is perhaps more to the point, it will be found when in the course of eight or ten years (perhaps sooner) obsolete machinery has to be replaced, the sinking fund for paying off the capital cannot be touched for any other purpose, and, unless provision be made in another way, a very serious state of things will have to be met.

The next question to be solved by the same illustration is that of assessment to the poor rate and other local rates. In respect of this, it is also argued that a municipality should be dealt with more tenderly than a private company; but there is no need to meet argument with argument in this case. The Courts have decided the matter; and it only remains for the rating authorities to do their duty. In the transaction assumed, if the business were an ordinary manufactory, the rent of 8 per cent. would be taken as the gross estimated rental; and there would be a deduction of one-third—leaving $5\frac{1}{3}$ per cent. on the capital employed as the "net rateable value." But taking 4 per cent. only, and assuming an average of 7s. in the pound for the whole of the rates in most of the large towns, the following samples will show the way in which assessors deal with municipalities.

	Capital.	Amount paid, Including Income-Tax and Rents.	Should be for Local Rates Only.
No. 1 . . .	£102,827	£216	£1,439
No. 2 . . .	138,888	205	1,944
No. 3 . . .	316,144	341	4,426
No. 4 . . .	45,313	56	634
No. 5 . . .	88,879	110	1,244

Many more such illustrations could be given. It is understood that a different method is used for calculating the assessment of electricity companies, based upon profits; but the results will not be found to differ greatly, and no more practicable method has been devised for dealing with municipalities which may elect to carry on the works at a loss, but which have nevertheless to be rated according to law. The claim for a light assessment, because municipalities profess to act upon the phrase "the greatest good for the greatest possible number," and so supply the ratepayers at less than the cost price, cannot be admitted. They have no monopoly in this respect, as many tradesmen have acted in the same way. The baker has repeatedly supplied his bread at less than cost price; and others have done the same kind of thing. It is true that those who have practised this method have usually found themselves in the Bankruptcy Court; but no one claims for them that their local rates shall be remitted. On the contrary, these form one of the first charges on the estate.

For similar reasons, it is also claimed that no portion of the general, legal, and establishment charges of the municipality should be debited against these trading undertakings, which occupy so much of the time and attention of the staff; but such a contention will not bear the least examination. It is manifest that if the town clerk, borough surveyor, borough treasurer, and their respective staffs, had only to attend to ordinary municipal matters, the number employed would be fewer and the salaries lower than if they were compelled to deal with half-a-dozen trading concerns in addition. In this, as in everything else, the ordinary practice of business cannot be rightly ignored. If a builder determined to take another business, and to manufacture stoves, for instance, he would require additional clerks for the general office work, apart from the staff for the special manufacture; and he would not give orders for the salaries of the whole of such general office staff to be debited to the building business, and for no charge to be made against the other. It is a departure from sound principles, which has no justification in the eyes of anyone accustomed to deal properly with accounts.

It is now necessary to look at another part of the subject, and see how the hypothetical tenant would deal with the question of ascertaining the cost of producing the electric current. We have seen that in the first instance he pays a rental amounting to 8 per cent. on the landlord's capital. He would then have to pay for wages, materials, rates and taxes, and all legal and other expenses necessary for his business. Is it not clear, beyond the possibility of dispute, that the total of these payments divided by the number of units produced is the *cost* of the current to him, and that nothing can be reckoned as profit except the amount received beyond this cost? Yet, simple as this proposition appears to the ordinary business mind, it is apparently never acted upon by municipalities; and the following illustration shows the general practice. The total cost of producing 578,275 units of electricity in a well-known borough was £10,002, including the payment for interest, &c.; and this works out at 4·15d. per unit. Nothing was set aside for depreciation; and a very insufficient sum was paid for local rates. If these were added, the cost would be 5·93d. per unit. Yet we find the following astounding entries: Works cost, 1·39d. per unit. Total costs, 1·84d. per unit. And on the faith of these calculations, the following charges were made: To private consumers for light, 6d. to 4d.; for power and heat, 2d. to 1½d.; and for public lighting, 1·76d. per unit. Now it is clearly understood that one has sometimes to sell his goods for less than they cost him. A draper making fair profits in the season would rightly sell anything remaining after it was over at less than cost price, rather than lose the whole value of such goods; but what can possibly be said for sending current made at the same time along two wires, in the one instance to be used for lighting at a charge of 6d. per unit, in the other (possibly to a next-door neighbour) to be used for power at a charge of 1½d. per unit? The consumer doubtless has the remedy in his own hands, as he can, if he chooses, fall back on the gas company to give him a better light at one-third of the cost. It is not like water, which is a prime necessity, and as to which the powers of the Legislature should be invoked against the official unfairness which compels a hotel keeper to pay nearly £100 a year, and allows a brewery using a much larger quantity of water to have it at a fair and reasonable price (say) £20 a year.

It has been contended that current for power should be sold for less than for light, principally because work is provided for the electrical machinery when it would otherwise be idle. But this no longer represents the facts. In most large towns, electricity is now used for light, heat, tramways, and power; and continuity of service is thus assured. But were it otherwise, is it not open to consumers for light to use the same argument as consumers for power—viz., "The machinery is employed during the day for the latter purpose; we provide work for it by night when it would otherwise be idle, and therefore current for power should be charged at 6d. per unit and for light at 1½d.?" If a merchant found by extending his connection that he could cheapen production, he would not devote the whole of the gain to his new customers. At any rate, if he did, he would be careful to avoid letting his old friends know of it, though an electrical company would be quite justified in making *some* reduction to long-hour consumers or for any other special cause where it was evidently reasonable.

But whatever may be said for selling to customers at less than cost price, nothing can excuse a transfer from one department to another in the same concern at anything less than full cost. Every business in the country would be in jeopardy if this were permitted. If the head of a department losing money could arrange with the head of another department in the same concern making handsome profits, to transfer a large quantity of goods at less than half the cost price, the effect would be most ruinous. The general manager might be pressing that part of the business which was really losing, and neglecting that in which the profit accrued. Taking the accounts before alluded to, and allowing that larger plant may cheapen production, and the price come down from 5·93d. to 4d. per unit, is it not evident that this sum should be the charge against any other department under the corporation? It is not easy, on the face of it, for a plain man to see why it is not so; but it is quite easy to see the reason, when there is the manifest determination to continue a non-paying business which the ratepayers would never sanction if all the facts were known. In the borough in question, if the true price were shown for electric current in the public lamps, the gas company would be enabled to prove that they could supply a better light at about one-third of the cost; and a similarly correct charge made against the tramway undertaking would add £5000 per year to the cost, and make the loss upon it mount up to about £13,000 per year, supposing a proper assessment and depreciation fund were provided for.

The Legislature has given extensive powers to municipalities for carrying on trading operations, with the evident intention that those powers should be used in accordance with the well-tried methods of business men; and there is an urgent necessity for some further action on the part of Parliament, now that it is so abundantly clear that the usual and necessary precautions for avoiding disaster are being ignored.

Before concluding, it should be mentioned that the following objection has been raised against this article by an expert. The cost varies according to the "load-factor" of the consumer. Whether he uses the current for light or power does not matter. What governs the cost and fair price is the constancy and regularity of the demand. Thus, to supply 1000 units per quarter to a lighting consumer averaging two hours' demand per day, requires five times as much machinery as to supply a power consumer averaging a demand of ten hours a day. In both instances, the price includes an amount for interest on capital, which manifestly should be much greater in the case of the lighting consumer. The reply to this is that there can be no doubt *some* difference should be made; but to charge light consumers 6d. per unit, as against 1½d. for power, cannot be justified on any ground. The theories of electrical engineers will not bear the test of facts. An installation for lighting has often to give place to one for lighting, tramway, power, and heat. Yet, according to theory, the light users must pay the interest and sinking fund on the lost capital and four-fifths of the additional amount required. Moreover, theory does not square with fact in another way. Large numbers of light consumers in cities and big towns use the current all day; and numbers of power consumers only employ it for an hour or two per day. Then, too, current for heat is usually charged at the same rate as power; and yet one of the principal inducements for using it instead of coals is that, like a gas-stove, it can be turned on for an hour or two, and be dispensed with for the remainder of the day. There is also the further reply that in the "Electrical Review" for April 17 last a paper appeared for the benefit of those who do not know how to design power plant without laying down five times as much machinery as would ordinarily be required to meet the lighting difficulty. It has been shown that accumulators enable a small electric generating plant to be run uniformly; and these provide the necessary current for the few hours of greatest demand, when the whole of the lights are in use.

A French Gas Directory.—A new edition has just been published of the "Annuaire Général de l'Industrie de l'Eclairage et du Chauffage par le Gaz." This directory, which was started by the late M. Emile Durand in 1874, and conducted by his son, M. Paul Durand, until his death in April last, contains a large amount of information relative to gas supply, not only in France but in other European countries. The contents are grouped in eight sections, the third of which gives a list of gas companies and their officials, gas engineers, technical societies, &c.; and the rest are devoted to patents, photometry, electric lighting installations, and other matters. The "Annuaire" is published by Madame Durand, at the offices of "Le Gaz," 12, Rue Fontaine, Paris.

The Young and Bell Patents.—Application is to be made next session to the Secretary for Scotland, under the Private Legislative Procedure (Scotland) Act, 1899, for a Provisional Order to reinstate, continue, and confirm the following patents: No. 12,421 of 1892, granted to William Young and Alexander Bell, for "Improvements in the decomposition of mineral oils for the production of illuminating gas;" No. 12,355 of 1893, granted to William Young, for "Improvements in the production of illuminating gas from mineral oils and in apparatus therefor, and for producing water gas;" and No. 13,126 of the last-named year, also granted to William Young, for "Improvements in the production of illuminating gas and bye-products from liquid hydrocarbons, and in apparatus therefor."

TECHNICAL RECORD.

FLOW OF GAS IN LONG PIPES AND UNDER HIGH PRESSURES.

In the "JOURNAL" for June 2 (p. 586) we were enabled, by the kindness of Mr. H. A. Humphrey, to publish the formula for the calculation of the isothermal flow of gas in long pipes; and more than one correspondent having written pointing out the difficulty experienced in working out an example from the formula, the matter was referred to Mr. Humphrey, who has been good enough to send the following explanation. We feel sure this will be of interest, not only to the correspondents on whose behalf we communicated with Mr. Humphrey, but to other readers.

Pressure at inlet end of pipe 50 lbs. per square inch.
" " distant " " 1 lb. " " "
Diameter of pipe 2 feet.

Wanted the quantity of Mond gas which can be transmitted through a pipe 20 miles long under these conditions.

Let P_1 = Initial absolute pressure in lbs. per sq. ft.
P_2 = Final absolute pressure in lbs. per sq. ft.
T = Absolute temperature in degrees Fahr. (461 + t° F.).
L = Length of pipe in feet.
V = Volume in cubic feet of 1 lb. of Mond gas.
u_1 = Initial velocity of gas in pipe (feet per second).
c = Constant in equation $P\,V = c\,T$.
m = Hydraulic mean depth $\left(\frac{d}{4}\text{ for circular pipes}\right)$.
ζ = Coefficient of friction.
g = Acceleration due to gravity, 32·2.
d = Diameter of pipe in feet.

$$\text{Then } u_1 = \sqrt{\left\{\frac{g\,c\,T\,(P_1^2 - P_2^2)}{P_1^2\,(\zeta\frac{L}{m} + log_e\,\frac{P_1}{P_2})}\right\}}$$

Professor Unwin found that for air $\zeta = \cdot0027\left(1 + \frac{3}{10d}\right)$; and the corresponding figure for Mond gas will differ but slightly from this. As d = 2

$$\zeta = \cdot0027\left(1 + \frac{3}{10 \times 2}\right) = \cdot00310$$

At 60° Fahr. and atmospheric pressure, 1 lb. of dry Mond gas occupies 16·57 cubic feet.

Atmospheric pressure = 2116 lbs. per square foot absolute. Also 60° Fahr. is to be measured from the absolute zero, and must be written as 60 + 461 = 521.

The fundamental equation for a perfect gas is—

$$P\,V = c\,T$$

and to find the value of c we have—

$$2116 \times 16{\cdot}57 = c\,521.$$

$$\text{or } c = \frac{2116 \times 16{\cdot}57}{521} = 67{\cdot}30.$$

Turning to the general formula, we may now obtain the value of $g\,c\,T$, thus—

$$g\,c\,T = 32{\cdot}2 \times 67{\cdot}3 \times 521$$
$$= 1{,}129{,}000 \text{ approximately.}$$

From an inspection of the formula, it is clear that, as we are dealing with the *ratio* of pressures, we may substitute pressures per square inch (p) for pressures per square foot, both absolute, without altering the value of the expression.

We have $p_1 = 50 + 14{\cdot}7 = 64{\cdot}7$ lbs. per sq. in. abs.
$p_2 = 1 + 14{\cdot}7 = 15{\cdot}7$ lbs. per sq. in. abs.
$p_1^2 = 4186{\cdot}09$
$p_2^2 = 246{\cdot}49$
$\therefore\ p_1^2 - p_2^2 = 3939{\cdot}60$
also $L = 20 \times 5280 = 105{,}600$ feet
and $m = \frac{d}{4} = \frac{2}{4} = \frac{1}{2}$
$\therefore\ \frac{L}{m} = 211200.$

$$\text{Again, } \frac{P_1}{P_2} = \frac{p_1}{p_2} = \frac{64{\cdot}7}{15{\cdot}7} = 4{\cdot}12$$

$log_e \frac{P_1}{P_2}$ is the hyperbolic logarithm of the ratio of the pressures (and may be found from a table of hyperbolic logarithms or by multiplying the common logarithm by the multiplier 2·302585)

$$log_e\ 4{\cdot}12 = 1{\cdot}4159$$

We can now substitute all the calculated values of the different factors which occur in the general formula, and we get the initial velocity of the gas in feet per second—

$$u_1 = \sqrt{\left\{\frac{1129000 \times 3939{\cdot}6}{(4186{\cdot}09(\cdot0031 \times 211200 + 1{\cdot}4159)}\right\}}$$

giving $u_1 = 40{\cdot}24$ feet per second.

Now the sectional area of our 2-feet diameter pipe is 3·1416 square feet, and if Q = the quantity of gas per second passing a section at the inlet end—

Q = velocity × area
= 40·24 × 3·1416 cubic feet per second.

But we usually want to express the quantity as if it was measured at atmospheric pressure, instead of at the actual pressure of the gas at the inlet. Calling this new quantity Q_a.

$$Q_a = \frac{p_1}{p_a}\,Q$$

$$Q_a = \frac{64{\cdot}7}{14{\cdot}7} \times 40{\cdot}24 \times 3{\cdot}1416$$
$$= 556 \text{ cubic feet per second.}$$

The final solution is therefore—

Quantity of Mond gas transmitted per minute 33,360 cubic feet.
" " " " per hour 2,001,600 cubic feet.

It may be noticed that when L is large the value of the expression $\zeta\frac{L}{m}$ is much greater than $log_e\,\frac{P_1}{P_2}$; and, consequently, for long pipes this last expression may be omitted without incurring any serious inaccuracy.

COMBUSTION PRODUCTS OF GAS AND OIL STOVES.

In the "JOURNAL" for the 18th of August (p. 424), we called attention to the results of some experiments carried out by Dr. T. E. Thorpe, the Chief Chemist of the Governmen Laboratory, with five stoves commonly used in factories and workshops—three burning gas and two oil—sent to him by the Office of Works with the view of ascertaining the presence of deleterious compounds in the products of the combustion given off by them. The particulars we gave were taken from Dr. Thorpe's general report on the work of his Department; but he entered more fully into the subject in a letter addressed to Dr. T. M. Legge, the Medical Inspector of Factories, which is included in his annual report to the Chief Inspector (Dr. B. A. Whitelegge). The following are Dr. Thorpe's remarks:—

I.—GAS-STOVES.

In stove A the burner is of the argand type, giving a luminous flame which does not impinge upon any so-called "fuel" or other solid substance. The products of combustion circulate through a system of air-chambers, and the gaseous portions eventually pass into the room. Much of the moisture is condensed, and drips into a receptacle at the bottom of the stove, carrying with it dissolved sulphuric acid derived from the burning of the sulphur compounds originally present in the coal gas.

The burner in stove B is of the atmospheric or bunsen type, giving a non-luminous flame which impinges on perforated fire-clay tubes. The products of combustion pass up one air-chamber at the front of the stove, and down a similar chamber at the back, whence a tubule for connection with a flue leads them from the stove.

In stove C the burner is also of the atmospheric type, and the non-luminous flame impinges at its tip upon fire-clay skeleton "fuel." The combustion products pass up a system of tubular pillars to a flat chamber at the top of the stove, thence down other pillars to a similar chamber at the bottom, and so out into the room—a portion of the moisture being condensed, as in stove A.

Before proceeding with the investigation, a letter was addressed to the makers of the stoves, asking them to tell me the conditions as to gas pressure and rate of consumption under which they considered their stoves shoud be tested. The substance of the replies was as follows:—

Stove A.—There is a regulator fixed under the burner to prevent the flame running to smoke. The regulator will come into action at 15-10ths pressure. The gas consumption, when the gas is full on, should be 8 feet.

Stove B.—The stove has burnt steadily at 7-10ths of an inch pressure; and the rate of gas consumed with the ten tubes ignited is slightly under 20 feet per hour.

Stove C.—The stove does not profess to carry away the whole of the deleterious products; it is only recommended for use in fairly well-ventilated situations, where it is not possible to use a flue. Our "C" should be fixed with a quantity-governor, limiting the gas consumption, at 10-10ths pressure, to 15 cubic feet per hour.

With regard to stove B, I may say that it was found impracticable to light the burners at the pressure mentioned by the manufacturers—7·10ths of an inch. After communications had been passed, the manager of the firm in question paid a visit here; and upon witnessing the behaviour of the stove, he expressed himself as satisfied that a higher gas pressure than that mentioned was necessary for proper working.

Carbon monoxide and acetylene were the deleterious substances specially tested for in the escaping gases. The stoves were examined in two ways: (1) By burning them openly in the room, and withdrawing the combustion products direct from the

outlets of the stoves; and (2) by allowing them to burn under a large cover provided with adequate inlets and outlets for air, &c.—the products of combustion being taken from under this cover for analysis. The latter method imitates, in an exaggerated form, the conditions under which the stoves would be burning if used in a small ill-ventilated room. The following are the results obtained:—

I.—*Stove Burning Openly in Room (Products Drawn Direct from Stove).*

Stove.	Gas Pressure. Ins. of Water.	Gas Consumption. C. Ft. per Hour.	Carbon Monoxide. P. Ct. by Vol.	Acetylene.
A	1·05 to 1·50	7·5 to 7·8	Traces from 0·001 to 0·005 p. ct.	Absent.
B—1st stove .	1·40 ,, 1·50	19·4 ,, 19·8	0·032 to 0·041	,,
C	0·85 ,, 1·00	12·6 ,, 14·7	Traces from 0·002 to 0·007 p. ct.	,,

II.—*Stove Burning under Cover (Products Drawn from under Cover).*

A	0·85 to 1·45	7·0 to 7·5	Traces practically *nil*, to 0·003 p. ct.	Absent.
B—1st stove .	1·90	19·9	0·047	*Nil.**
2nd stove .	1·20 to 1·50	17·2 to 19·5	0 034 to 0·058	,,
C	0·90 ,, 0·95	14·6 ,, 15·1	Traces from 0·002 to 0·003 p. ct.	Absent.

* Or, at most, inconclusive indications.

These results, as they stand, are not comparable with one another, because the products analyzed are not drawn from the same points relative to the burners, and the degree to which they are diluted with air is consequently variable. But by making a simultaneous determination of the amount of carbon dioxide present in the products of combustion, the quantity of monoxide found can be connected accurately with the volume of gas burnt. From the known composition of coal gas, the quantity of carbon dioxide found in any experiment represents a known volume of the original gas.

Reduced in this manner to the same standard—namely, the volume of carbon monoxide produced during one hour's burning of the stove, the results of special experiments made for this purpose give the following comparison:—

Stove Burning Openly in Room (Products Drawn Direct from Stove).

Stove.	Inches.	Consumption. Cubic Feet per hour.	In Products Analyzed. CO_2 Per Cent.	CO. Per Cent.	Carbon Monoxide Produced in one Hour's Consumption. Cubic Feet.
A	1·50	7·5	1·841	0·0012	0·0024
B	1·50	19·8	6·696	0·0320	0 0480
C	1·00	14·5	2·697	0·0018	0·0048

In the case of stove C, the characteristic blood reaction for the presence of carbon monoxide—namely, the absorption spectrum of carbonyl-hæmoglobin—was obtained without difficulty in the products drawn direct from the stove. In the case of the other two stoves, the amount of carbon monoxide is too small to be detected by this means; and the test was consequently not applied.

It will have been noticed that no acetylene was found in the products from any of the stoves.

As regards the significance of the numbers for carbon monoxide given in the last table, from the hygienic point of view much, of course, will depend upon how far the products are allowed to accumulate—in other words, upon the ventilation of the room in which the stoves are burned. Supposing, as an extreme case, that the stoves could be each burned in a closed cubical room of (say) 10 feet side, the average quantity of carbon monoxide in the air of the room at the end of one hour would be: With stove A, 0·00024 per cent.; with stove B, 0·00480 per cent.; and with stove C, 0·00048 per cent. In five hours the corresponding figures would be 0·0012, 0·024, and 0·0024 per cent. respectively. In practice, this precise state of things, would, of course, never obtain, since there would always be more or less ventilation. But, on the other hand, in practice, the products of combustion would not be equally disseminated throughout the room, and work-people engaged at particular spots might have to inhale far more than the average quantity of the products of combustion. The foregoing figures, therefore, may serve as a very rough sort of criterion whereby to judge of what would be the actual conditions in a small badly-ventilated room.

The stove B should not, I think, be used except in attachment to a flue. The products of combustion drawn from this stove produced distinct symptoms of poisoning in mice after about an hour; and although, when diluted with air to the extent which would be reached in practice, they might not give rise to any very serious effects on the human system, it is still quite conceivable that they might produce minor evils, such as headache, lassitude, depression of spirits, and so forth. The stove is, in fact, as already mentioned, fitted with a tubule for connection with a flue. This connection should, in my opinion, be always insisted on.

II.—Oil-Stoves.

Two specimen stoves were sent me by the Office of Works. Both these stoves have a circular reservoir through which passes a central air-tube, and both have wicks of the cylindrical type. The flame of stove D is non-luminous; that of the heater E is luminous. Kerosene is the fuel employed in each case.

The two stoves were tested by examining the products drawn directly from the top of the stove. In both cases a small quantity of carbon monoxide was found; the results of the experiments being as follows:—

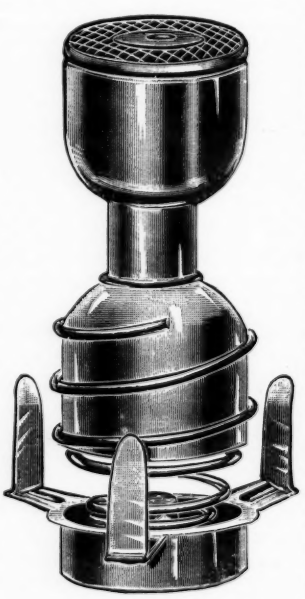
Stove.	Consumption of Kerosene. Ounces. Per Hour.	In the Products Analyzed. CO_2 Per Cent.	CO Per Cent.	CO Produced in One Hour's Burning. Cubic Feet.
D—(1) Turned fairly high .	5·9	11·781	0·029	0·023
(2) Turned very low . .	4·0	7·919	0·022	0·017
E—Practically at maximum	10·7	5·458	0·010	0·032

It will be seen that these quantities of carbon monoxide for the hour's burning are appreciably greater than those yielded by the gas-stoves A and B on the one hand, but less than that produced by the C radiator on the other.

In the portion of his report dealing with "Temperature," the Chief Inspector refers to Dr. Thorpe's remarks, and says they show that while all flueless stoves give off impurities, the most dangerous product—carbon monoxide—is usually present in such small proportion that, with proper ventilation, it could not reach the percentage which has been found to cause mischief. He says the conclusions to be drawn are: "(1) That flueless stoves vary in their output of injurious products, including traces of carbon monoxide; (2) that they do not aid ventilation, but directly increase the need for it and the amount required; and (3) that, given adequate ventilation, certain flueless stoves may be used without demonstrable risk."

A CHEAP ANTI-VIBRATOR BURNER.

New ideas for simplifying fittings in connection with incandescent gas lighting are constantly emanating from the trade; and the New Export Incandescent Lighting Company, Limited, are among the number who occasionally bring novelties to notice. Their latest one is a cheap combination of burner and anti-vibrator. It is the view of the Company—and the idea, it will be granted, is a sensible one—that all that is wanted for street lighting and in places where the mantles are subject to shock, is a little device to neutralize any injurious movement of the mantle itself, and not to carry the whole weight of the burner, chimney, and globe. The simple expedient which they have adopted is shown in the illustration. It is merely a spiral spring, the small part of which is connected to the gas-injector inside the base of the burner, while the larger part winds (as shown) round the exterior of the lower mixing-chamber of the upper part of the burner. In this way, it is only the movement of the top part of the burner (carrying the fork and mantle) that has to be dealt with; and this, of course, is quite sufficient. The whole purpose of anti-vibratory devices is to protect and save mantles; and therefore it is superfluous to have any arrangement which exceeds the requirement for effecting the purpose. The illustration shows the spring stretched open so as to give a better idea of the proposal.



A second burner will shortly be made by the Company in which the anti-vibratory arrangement will be completely hidden. In this there will be a spring in the upper mixing-chamber, the top part of which spring will provide a seat for the portion of the cap forming the fork-holder. The wire will extend straight through the stem of the burner, and end in a second spiral which will be attached to the gas-injector in much the same way as the present illustrated plan. This will obviate any objection that may be raised to the spring being exposed as in the first form of the burner.

The burner is only made in one quality, and that of a cheap character. To meet the needs of those who fancy a better looking article, the burner, or at all events the lower part of it, should be made of better quality; but the argument of the Company is that they are supplying these burners at such a cheap rate that lighting authorities can afford to renew them at frequent intervals, instead of troubling about trifling repairs. A second objection that may perhaps be raised to the burner in some localities is that the air supply will be of a rather too liberal character, with the inlets at the bottom of the injector and the free way through the spring all round. It will be an easy matter to increase the air supply, but a difficult one to reduce it to a nice point. However, the feature of the burner is the simple anti-vibratory arrangement, which is certainly very sensitive. The low cost will admit of a good trial being made with it.

REGISTER OF PATENTS.

Inclined Retorts.—Stiles, H., of Rochdale. No. 25,747; Nov. 22, 1902.

The patentee proposes the construction of an inclined gas-retort having a recess formed in the lower part of the mouthpiece-end, for the reception of fire-brick slabs or tiles for the coal-stopper to rest upon, and which can be removed and replaced with new ones when worn away.

Fig. 1 is a front elevation of the mouthpiece-end of an inclined gas-retort constructed with removable fire-brick slabs or tiles in accordance with this invention. Fig. 2 is a sectional elevation on the line W.

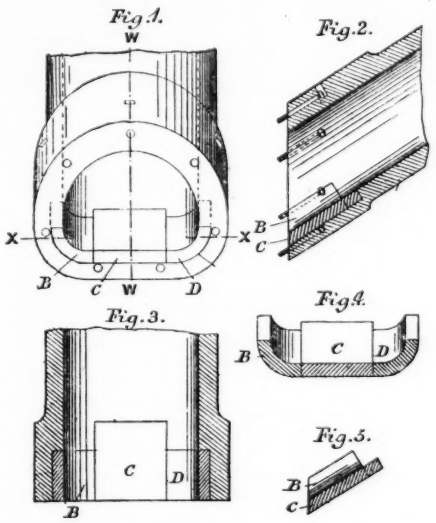


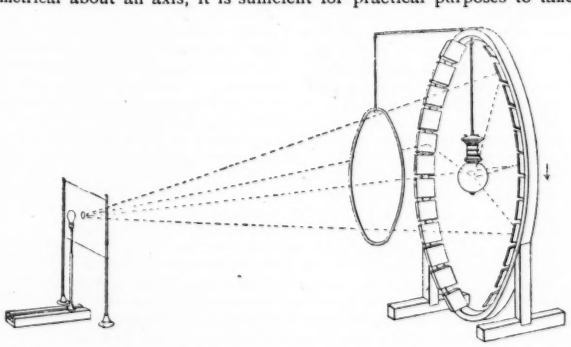
Fig. 3 is a sectional plan on the line X. Fig. 4 is a sectional front elevation, and fig. 5 is a sectional side elevation, of the slabs or tiles separate from the retort.

The lower portion of the mouthpiece-end of the retort is made with a rebated recess provided with fire-brick slabs or tiles B C D, which fit in the recess and fill it up level with the bottom of the retort. While not confining himself to any particular number or shape of slabs or tiles, he prefers the arrangement shown—namely, one flat fire-brick slab or tile C which fits in the central portion of the mouthpiece-end, and two curved or rebated tiles B D which fill up the recess at the curved sides of the retort from where the arched top springs. These slabs or tiles B C D can be removed either when the retorts are hot or cold, and new ones substituted so as to make up the lower surface of the mouthpiece-end "perfectly smooth for the discharge of the coke."

Photometers.—Carolan, E. A.; a communication from the General Electric Company, of Schenectady, N.Y., U.S.A. No. 26,035; Nov. 26, 1902.

This is an apparatus (designed by an electrician) for measuring radiation, consisting in a series of reflecting devices so placed that each reflects radiations from the source of the average intensity which would exist on one of a series of zones of equal area on the surface of an imaginary sphere surrounding the source.

The specification points out that, in order to determine exactly the total flux or spherical intensity of light issuing from a luminous source, it is necessary to determine the intensity at each point on the surface of a sphere having the source of light at its centre; but as most commercial sources of light have a distribution which is practically symmetrical about an axis, it is sufficient for practical purposes to take



photometric readings about a great circle passing through the poles of the axis of symmetry, and thus determine the intensity. "To take individual readings all around the circle is a laborious process, and, moreover, not reliable, since (during the time of taking the readings) the intensity of the light may change, and, in fact, does change in some forms of lamps—as for instance, the electric arc lamp."

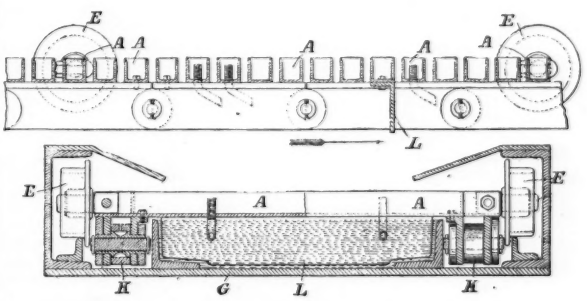
In order to determine the intensity about a great circle at one reading, the patentees have devised the integrating photometer shown, in which one or more series of mirrors are arranged about the light in a great circle which passes through the axis of symmetry of the light. The mirrors are set so that each reflects the image of the source to be measured on a photometric screen placed in the axis of the circle at some distance from the source. Each mirror—or, in case the mirrors are arranged in pairs with respect to the symmetrical axis, each pair of mirrors—may be considered as measuring the intensity of light of the zone which lies between planes passing perpendicular to the axis of symmetry midway between successive mirrors.

As the result which it is desired to obtain is the product of the intensity of light into the area over which that intensity exists (or rather the average of such a product), it is necessary that the intensity of the light which is obtained by the reflection in the mirror be multiplied by some factor which will give this desired result. As is well known, the patentees say, the spherical areas of zones formed by planes taken perpendicular to an axis of the sphere are proportional to the distance between such planes measured along the axis. Hence the area of zones marked out by successive planes separated from each other by equal distances are equal. The mirrors, therefore, are so placed that they lie midway between planes which mark out zones of equal areas. As a result, the average of the intensities given by the mirrors will give the desired result, since each mirror, or each pair of mirrors, gives the average intensity which exists over one of a series of equal areas.

Conveyors for Hot Coke.—Gibbons, W. P. & G. B. A., of Lower Gornal, Staffs. No. 26,121; Nov. 27, 1902.

In this conveyor, the coke or other material to be conveyed is carried along a water-trough by the movable part of the conveyor, which is formed of transverse trough section bars arranged at short distances apart and mounted on side links of the conveyor chains. The bars contain water to keep them cool and assist in quenching the coke; and they form a continuous grating between which the coke dust falls to the bottom of the trough and along which the fine material is scraped by scrapers fixed at intervals to the underside of the moving part of the conveyor. Thus the coke, being carried by the bars, is not, it is claimed, "broken nor unduly saturated, and is conveyed separately from the fine coke dust or other fine material which has fallen through the grating."

A are the hollow transverse bars of which the conveyor is formed. They are arranged side by side transversely to the direction in which they travel, with a very narrow space between each; and they are fixed (with their hollow sides upwardly) to the side links of two ordinary conveyor chains arranged underneath and near the ends of them—that is, at the two sides of the moving part of the conveyor. The conveyor chains are made by preference with rollers K on their joint pins, so that in passing over the sprocket wheels there is but little friction against the teeth. The bars are preferably fixed to the upper sides of the links of the chains by screws, so that the bars can readily be removed and replaced when required.



The ends of the hollow bars A are closed so that water will be retained in the troughs of the bars; and they are provided with projecting pins forming axles on which are rollers E, which run along tracks at the sides of the trough and thus support the conveyor.

The water-trough used in combination with the moving part of the conveyor is by preference composed of bottom plates G and two angle-section side-bars riveted thereto so as to form the sides of the water-trough, along the top of which the bars A travel. The bottom is extended at each side beyond the bars and riveted to longitudinal channel section bars, which form enclosed sides of the track and carry the angle bars along which the conveyor travels. The spaces between the bars and the sides of the water-trough are for the conveyor chains to travel along outside the water-trough. To the tops of the channel section bars covering plates are riveted, which slope downwardly towards the water-trough and extend over the two conveyor chains, so as to prevent the coke and ashes or dust falling upon them.

When the conveyor is in motion, the hot coke falling on the hollow transverse bar part A of the conveyor is carried along; and as the bars are filled with water (by running in the water-trough or by passing under any convenient water supply), they are less liable than usual to warp and twist by the action of the hot coke or other hot material falling on them. Moreover, "the water evaporated by the hot coke tends to quench the coke without undue saturation, as the superfluous moisture drains away between the bars into the trough below."

Any portion of fine coke dust passing through the spaces between the bars into the water-trough below is removed by scrapers L carried by the conveyor and arranged below the trough section bars at intervals apart—say, about 15 or 20 feet. Each of the scrapers can conveniently be fixed to the underside of one of the cross-bars.

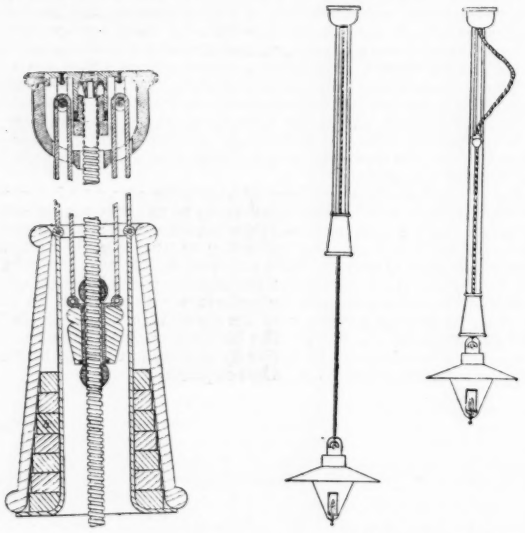
When ashes or other fine material is to be conveyed, the spaces between the transverse bars are reduced so as to prevent the bulk of the fine material from falling through into the water-trough below.

Gas Regulators or Governors.—Bolton, E. J., of Rolls Road, S.E., and Walker, E., of Old Kent Road, S.E. No. 27,880; Dec. 17, 1902.

This invention is particularly applicable to gas-regulators in which a chamber, bellows, or diaphragm is lifted (according to the pressure of the gas within) so as to cause a valve for admitting the gas to open or close according to the direction in which the chamber, bellows, or diaphragm is moved. The proposal is to insert at the inlet of the regulator or governor a fine-woven gauze disc, kept in place by a screwed plug. The plug is made easily adjustable, so as to allow of the cleaning away from the seat of the gauze disc, the dirt, dust, and corrosive substances accumulated there, by the pressure of the gas, and which "would, but for the intervention of the gauze disc, enter the intricate mechanism of the regulator or governor, and cause it to become clogged and thereby render the governor useless."

Anti-Vibrating Fittings for Incandescent Gas-Lights.—Helps, G., of Nuneaton. No. 28,319; Dec. 23, 1902.

This invention has for its object the raising or lowering in a vertical direction of a burner-fitting or other pendant attached to one or more flexible tubes secured to a ceiling fitting or the like without causing the flexible tubes carrying the same to pass over drums or pulleys. This is effected by fixing to a ceiling fitting any number of friction rollers over which cords or chains pass, which are attached at one end to a counterbalance weight and at the other end to a grip, collar, or attachment secured to the flexible tubing in any convenient position—say, as shown in the engraving.

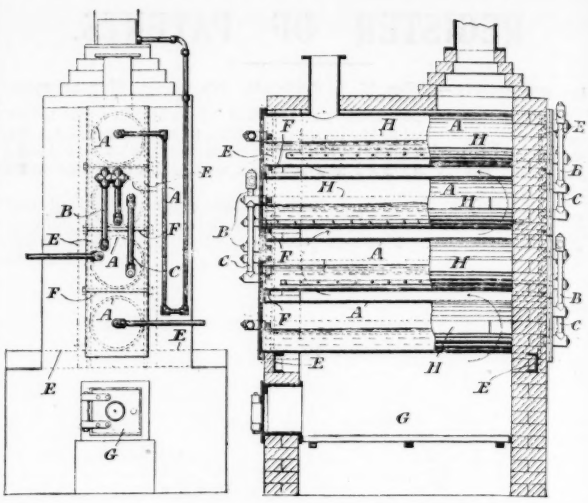


There is an adjustable clip which grips the flexible tubing in any desired position, so that the tubing below it continues to hang vertically whether the gas-fitting with which it is connected is hanging at its fullest extent or with the fitting raised. In the latter case, loops are formed in the uppermost portion of the tubing; and a ceiling ornament can be so arranged as to conceal all the flexible tubing which is looped or coiled above the grip. The grip can be in the form of an ordinary screwed nut—the threads being cut to correspond with the pitch of the coils in the metallic flexible tubing—or clipped on to metallic flexible or other tubing by means of clips, set-screws, or the like.

Distilling Ammoniacal Liquors.—Wilton, T., of Beckton, and Wilton, G., of Mark Lane, E.C. No. 28,251; Dec. 22, 1902.

Hitherto it has been the custom, the patentees remark, to employ in the distillation of ammoniacal liquors a continuous still consisting of a number of superimposed trays or chambers, into which the liquor passes from the top, and is discharged at the bottom, while a supply of steam has been admitted to the lower chamber and passes through the liquor in each tray successively. Such apparatus is only adapted for use where a large supply of steam is obtainable, and, further, the bulk of spent liquor is largely increased by the condensation of the steam. It is therefore "too costly for use in works of small capacity." In works of small capacity, the practice has hitherto been to employ a boiler or vessel in which a quantity of liquor was boiled off by direct firing without the use of steam for heating the liquor; and when the charge was finished, the boiler was discharged and charged again for another operation. The object of the present invention is to provide a continuous still adapted for use in either large or small works and either for steam or direct firing.

The still is formed of a number of tubes or cylindrical chambers A of suitable diameter, having flanged ends to receive head or caps, by removing which the whole of the interior of the chamber is accessible The end-caps serve to carry the connections between the chambers. A steam-pipe B leads from the steam space of the lowest chamber and (after rising to a height above the liquor level in the next chamber) terminates in a perforated pipe lying along the bottom of the chamber below the liquor level, so that the steam which passes from the chamber beneath bubbles through the liquor. The liquor is conducted from the chambers to the chamber next below by means of a pipe C passing from beneath, or at the level of, the liquid in one chamber to below the level of the liquor in the one beneath. The tubes are set in brickwork or some suitable casing, so that their ends are exposed and accessible



at all times; or if required to economize the heat, the ends may be covered in with doors fitted opposite to them for access. The whole of the tubes or chambers are supported upon an angle-iron frame passing up either side of the tubes at their ends and fitted with cross pieces or bars F for supporting each tube. The connections between the tubes are arranged alternately at opposite ends (as shown), so as to cause a sinuous flow of the liquor and steam from one end of the series to the other; and in a similar manner, the heated gases from the furnace G are caused, by baffles H, to flow backward and forward longitudinally of the tubes as indicated by the arrows, and preferably in an opposite direction to the flow of the liquor.

Incandescent Mantles.—Boullier, J. A. E. H., of Paris. No. 18,166; Aug. 22, 1903. Date claimed under International Convention, Aug. 23, 1902.

Many attempts have, says the patentee, been made to produce incandescent gas-mantles from artificial silk and the like. All the processes heretofore proposed have consisted in introducing incandescing compounds into a viscous solution of nitrocellulose capable of being spun into filaments, spinning the viscous mass into filaments, and then denitrating them by the Chardonnet processes. But all these systems "are complicated and costly, and do not give uniform results either as regards the cost of production or as regards illuminating power."

The difficulties and the defects are, however, said to be obviated by the present invention, which consists in a process of impregnating nitrocellulose filaments, whereby such filaments can be charged with illuminating compounds so as to produce from them mantles which are "strong, durable, of great illuminating power, and of uniform quality."

Nitrocellulose filaments are not, it is pointed out, penetrated by water; and they are therefore not adapted to fix incandescing compounds. But they acquire this property in a high degree when they are treated with liquids which are capable of causing them to swell without dissolving them. Certain acids—such as formic acid, acetic acid, and nitric acid in suitable degrees of concentration—possess this property. The same result may also be obtained by using alcohol mixed with a small quantity of commercial ether, or with alcoholic ethers (ether salts), or with acetone, and generally with any liquids or substances which are capable of dissolving nitrocellulose. By reason of the presence of a liquid which has no dissolving action on nitrocellulose, these mixtures allow of producing the swelling of the filaments without dissolving them. The filaments thus physically modified are still nitrocellulose; but they have acquired the property of absorbing, and even of fixing, considerable quantities of incandescing salts.

The following example is given for the purpose of showing how this invention may be carried out: Nitric acid is selected as an example, because this acid is the cheapest; but the operation would be equally successful with concentrated formic acid of about 95 per cent. strength, or with crystallizable acetic acid mixed with a small quantity of water. The degree of dilution of these acids may vary according to the temperature at which the operation is effected. The other liquids already referred to may also be employed. It is to be understood that all the operations described are equally applicable to nitrocellulose filaments as well as to knitted or woven fabrics made of these filaments. The process is as follows: The filaments of nitrocellulose are introduced into nitric acid of preferably 35° or 36° Baumé; and they are left to macerate in the acid until they have swelled up considerably. They have now become transparent or opaline, and have a gelatinous appearance without having lost any of their original strength, whereby the subsequent operations are greatly facilitated. Several hours are required in order to produce this result at ordinary atmospheric temperature; but the transformation is much more rapid at a temperature of about 35° Celsius. When the filaments have assumed the appearance described, they are taken out of the acid, washed, and treated in a centrifugal machine, and then they may be dried or not dried as desired. For the following operations, however, it is preferable to employ the filaments in the moist state, so as not to diminish their absorbent capacity. This operation not only renders the filaments adapted to fix the incandescing salt, but also eliminates any mineral matters which may be contained in the nitrocellulose, and which would injuriously affect the illuminating power or the strength of the filament.

The nitrocellulose filaments thus modified are then immersed in a solution of, for instance, 100 parts of commercial incandescing nitrates

to 100 parts of water. These proportions will vary according to the weight of the incandescing compounds which it is desired to fix in the filaments. After several hours of maceration, and even much less—especially if the operation is carried out with the application of heat—the filaments are taken out of the bath; then treated in a centrifugal machine, or squeezed, for the purpose of eliminating therefrom the portion of the solution which has not become fixed; and then the filaments are left to dry at a gentle temperature.

These filaments of nitrocellulose thus impregnated and dried are subjected to a denitrating process—such as the processes of denitration employed at present in the manufacture of artificial silk, but by preference to treatment with hydrated sulphate of ammonia proposed by Frémy, because it does not introduce into the filament any foreign substance which cannot be removed by washing with water.

The filaments produced by these operations are knitted or woven into mantles; or if the mantle itself has been treated, the only remaining operation is to incinerate the mantle.

By this invention, mantles may, it is said, be produced which will leave from 35 to 40 per cent. of anhydrous oxides after combustion. Approximately, one gramme of nitrocellulose is sufficient for the production of one mantle.

Extracting Tar from Illuminating Gas.—Holmes, E. D., of Huddersfield. No. 20,677; Sept. 25, 1903.

This invention relates to apparatus of the kind described in patent No. 25,493 of 1901, which is constructed with two or more concentric tar-cups and a corresponding number of gas-passages and concentric counterbalanced regulating and tar-extracting drums having walls built up of perforated plates. In the present invention, the counterbalanced drums are provided with relief valves, which are normally held closed against the pressure of the gas by springs, but which engage with stops and are opened thereby should the drums descend too far and the

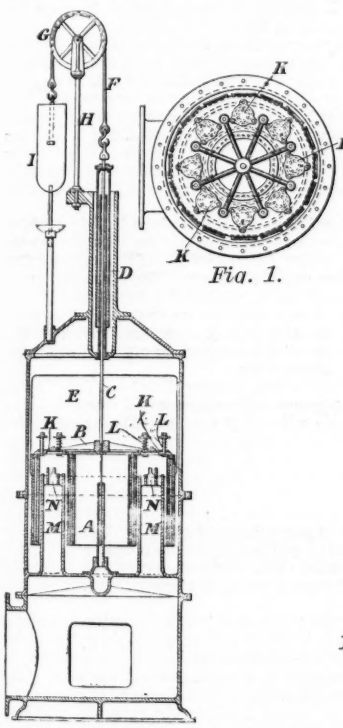


Fig. 1.

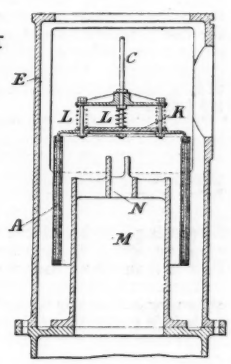
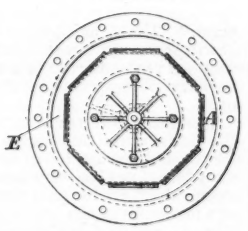


Fig. 2.



resistance of the springs be overcome by the unbalanced weight of the drums—as, for example, when the supporting rope or chain should break.

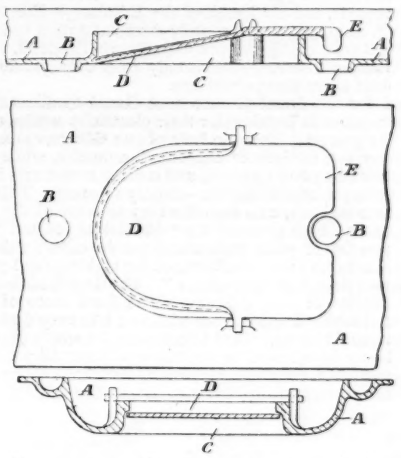
Fig. 1 is a vertical section and a plan (with parts removed) of the apparatus; fig. 2 shows corresponding views of the tar-cup, extracting drum, and gas-passage of a modified construction.

In fig. 1, a compound extracting drum A is attached by the spider B to a suspension rod C, which passes through a sealing D in the top of the purified gas-collecting chamber E. A suspension chain or rope F attached to the rod passes over a pulley G supported on a standard H fixed to the frame of the apparatus, and has attached to its other end a counterpoise I. The ring forming the head of the drum is pierced at intervals, and the holes covered by flat discs or valves K, which are normally held tight on their seats by the compression springs L. Round the upper end of the annular gas-passage M—at intervals corresponding to, and registering with, the valves K—are stops N having projecting ribs (preferably fashioned so as to cause as little obstruction as possible to the flow of the gas). When the drum descends so far that the valves K rest on the ribs of the stops, they will be opened if the unbalanced weight of the drum is sufficient to overcome the resistance of the springs; and the gas will then pass direct from the passage M into the collecting chamber E. This provision is specially made for the case of breakage of the suspension rope or the accidental detachment of the counterpoise.

In the construction shown in fig. 2—a modification which is more particularly suitable for small plants—a single annular tar-chamber is shown and a single central gas-passage and single drum, instead of the double tar-cup and compound drum of fig. 1. In this case, the drum is provided with a single central relief valve opened by a central stop in the gas-passage.

Condensing Gas-Stoves.—Fletcher, Russell, and Co., Limited, and Neil, A. & W. R., of Warrington. No. 20,087; Sept. 18, 1903.

The patentees remark that with the class of gas-stoves mentioned, it has been found that, if the gas should at any time be turned on for a short period before applying a light, the accumulation of gas and air confined in the tubes becomes inflammable, and is liable to cause an explosion. The present invention is intended to remedy this defect and prevent the possibility of any serious damage being caused in the event of such an accident.



The illustration shows a longitudinal section of part of the base-plate of a condensing gas-stove with the invention applied thereto, a plan view, and a transverse section.

A is the bottom plate of the stove, and B the usual escape-openings for the exit of the products of combustion. In juxtaposition with these ordinary openings (and preferably in a central position) is a much larger opening C in the base-plate above the water trough or vessel.

This is provided with a balanced escape-valve (or valves) D opening downwards, and normally kept closed by a weight E (or a spring or the like), so that in the event of an explosion taking place in the stove the extra pressure caused thereby will open the escape-valve, and allow the effects of the explosion to pass off freely and disperse without causing damage.

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24,371.—Davey, H., "Gas-engines." Nov. 10.
24,379.—Schneller, A., and Kolleman, D., "Bringing gas and liquid into intimate contact." Nov. 10.
24,406.—Matthews, J. J., "Acetylene generator." Nov. 10.
24,407.—Rasch, F. J. G. L., "Gas-burners." Nov. 10.
24,422.—Thorn, W., "Adjustable bye-pass cock." Nov. 11.
24,491.—Francis, A. S., "Gas-burners." Nov. 11.
24,513.—Estcourt, E., "Manufacture of gas for motors." Nov. 11.
24,519.—Thorp, T., "Gas-tap." Nov. 12.
24,541.—Cole, J. R., "Acetylene-generator." Nov. 12.
24,559.—Chambers, J. D., "Acetylene machine." Nov. 12.
24,587.—Rhodes, G., "Gas-engine." Nov. 12.
24,588.—Settle, T., and Padfield, W. A., "Manufacture of coal gas." Nov. 12.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Depreciation of Corporation Electrical Undertakings.

SIR,—My attention has been called to your reference to the Bolton electricity works, on p. 348 of the "JOURNAL," and to the letter of Mr. Donald Mackenzie, the Chairman of the Edinburgh Electricity Committee, which, on p. 425, very properly draws attention to the fact that in comparing Scotch municipalities with those in England, note must be taken that Glasgow's sinking fund is only 1 per cent., while Bolton's is three-and-a-half times that percentage.

It is usual for the Local Government Board to allow the English municipalities (outside London) for their electricity works, at the most, only a life of 25 years. Now the bulk of the Glasgow electricity debt is repaid either one-fortieth or one-fiftieth annually, while Bolton has only been allowed 23 and 25 years, and a more recent and larger sanction reduces this period still further—to only 22 years. This difference, as your readers will see, cuts into the very marrow of the question of depreciation; and both you and the "Municipal Journal" (on whose statements you based your arguments) are in considerable error in "assuming the same ratio of allowance for sinking fund payments in the English and Scotch municipalities." The Scotch office is evidently guided by experts of very different views from those of the Local Government Board. I quite agree with you it is very desirable that a Commission should be appointed to consider the whole question.

Perhaps I may be allowed to say that our Electricity Committee in Bolton is working on very nearly identical lines with those of Glasgow and Aberdeen as regards the year's result, as the following table will show you:—

Town.	Electricity Capital.	Depreciation and Sinking Fund.	Percentage on Outlay.
Glasgow	£1,041,746	£41,130	3·948
Aberdeen	194,079	8,537	4·398
Bolton	207,481	9,222	4·444

So that your readers will see that Bolton pays a higher percentage for depreciation and sinking fund together on its electricity capital account yearly, than either Glasgow or Aberdeen, although the "Municipal Journal" incorrectly stated "that the actual depreciation allowed at Bolton is therefore a much smaller sum than in either Glasgow or Aberdeen." The error of the "Municipal Journal"—and which you naturally copy—is occasioned by their working out these totals by the cost per unit sold.

It seems clear that the Electrical Engineer has had, perhaps, a freer hand in Glasgow and Aberdeen than in Bolton. At all events, we in Bolton have not overweighted the capital account of our undertaking for the units produced. When comparison is made per unit sold, the figures of depreciation and sinking fund come out: Glasgow, 0·859d. per unit; Aberdeen, 0·795d. per unit. Bolton only seems to put away 0·582d. per unit; while, as I have shown you above, Bolton really provides more than either of these towns.

I sympathize largely with the remark of Mr. Donald Mackenzie, of Edinburgh, that "the sinking fund contributions profoundly affect the financial position, when contrasting the various municipal undertakings in reference to depreciation;" and that is why we have not, in fixing our depreciation, taken any note of the sinking fund requirements. I admit that we make the sinking fund payments out of this full depreciation; and I do not see any particular reason why we should not do so. I think it likely, when it is legally practicable, that I should agree with Mr. Councillor Walmsley, the Chairman of our Finance Committee, whose paper is entirely based on the idea of a 50 or 60 years' repayment period, which might be then kept independently of the depreciation charged—for the latter can be reduced accordingly.

I hope this last opinion will take off some of the keen edge of your "startling discovery;" for I take it that we now, in effect, do what Mr. Walmsley would have us adopt under his two separate headings.

J. E. PANTON,
Chairman of the Bolton Corporation Electricity Committee.

Bolton, Nov. 18, 1903.

The Advantages of Profit-Sharing and Co-Partnership.

SIR,—Thinking our friendly controversy may be useful, I pursue it, not with the purpose of trying to show that you are mistaken on a point of procedure, but in the hope that by discussing the question of co-partnership, the great object you—equally with myself—wish to promote may be advanced.

I adopt your simile of the Parable of the Sower. Seed, soil, and sower are necessary; but taking the latter to represent the employer, it seems that in this case all depends upon him. He must be the initiator, which is his right as the leader of his workmen in improving their mutual relations. He, however, often hesitates to move, from a fear that his advances will not receive a friendly response. To tell him the soil needs clearing will most likely check any generous impulse; for if that is necessary he wants instruction, which I hope someone will supply.

I may say that in no case to my knowledge has any preparation been made. The idea of extending the sliding-scale to the employees is not new. It was suggested to the South Metropolitan Board in 1876; but in 1889—when the Gas Workers' Union had forced all the stokers to join, and were threatening all the others—our foreman Mr. Charles Tanner said to me that, unless something was done to attach the free men to the Company, they would all come under the power of the Union. Thereupon the profit-sharing scheme was launched without any preparation whatever. The free men all accepted the offer, while the stokers rejected it at the bidding of the Union, who two or three weeks later ordered the strike which came after, and not before, the profit-sharing system was introduced. In the case of the Crystal Palace District Gas Company, in 1894, there was no preparation. The offer was made without notice, and accepted at once—the Union not objecting. The same with the Commercial Company in 1901; the only difference being that the Union did object, but were totally disregarded by the men.

Therefore I cannot see that any preparation is required, or what is its nature, or how it is to be done. There is the soil, which we must take as we find it, and sow the seed, the fate of which will be very much as described in the Parable. The moral of it is that the responsibility rests with the sower—the employer. In the case of a gas company, it would generally be the chairman, or it may sometimes be the engineer or manager. It is work better worth doing than perhaps any that comes to his hand; for, while co-partnership is of incalculable benefit to the employees, it is also of immense value to the employer—the company—and it may even be a benefit to the Nation. Just now, the industrial world is comparatively quiet; but troublous times are certain to recur, for which it would be wise to prepare.

The two wings of the industrial army are at present far apart. They can be united and made one, to the general advantage. It is the hope that the gas industry may be induced to take the lead in this beneficent work that induces me to prolong the correspondence.

GEORGE LIVESEY.

Nov. 20, 1903.

The Rickmansworth Urban Council and the Gas-Works.

SIR,—My attention has been directed to an article under the above heading in the "JOURNAL" for the 10th inst., and to the "Editorial Notes" referring to the same matter. The article is so inaccurate that, if I should attempt to correct all the inaccuracies, I am afraid I should require more space in your paper than you would care to give me. I can only suppose that the statements contained in the article were supplied to you by an interested party, and were accepted by you without inquiry and without referring to the evidence given before the Committee of the House of Commons in the session of 1902 and the Committee of the House of Lords in the session of 1903.

As regards the date when the notice of intention to purchase was given, I may point out that the Urban Council have always taken a short holiday in the month of August; and hence the reason why the notice was given immediately after the meeting in September. The Council at the present moment has made an offer to the Gas Company for the purchase of the undertaking, so as to avoid, if possible, the expense and delay of arbitration proceedings; and this offer is under consideration. I venture to think that it is quite contrary to the spirit of English journalism to comment upon a matter which is, as it were, *sub judice*.

The article states the "rateable value of the place is only growing by about £200 a year;" whereas as a matter of fact the average since the creation of the urban district is over £1200 a year, and I am assured that the current year promises to keep up the average. The whole paragraph betrays such ignorance both of rating and of the borrowing powers of local authorities, that it is unnecessary for me to occupy your space by putting it right. I must, however, take exception to the expression "heavy rates," as our rates are no heavier and in some instances are lighter than the surrounding authorities.

The next statement refers to the financial juggling by which £15,700 share capital paying 6½ and 4½ per cent. was converted into £28,000 so-called £5 per cent. stock. Really this is the most feeble argument that it has ever been my misfortune to meet with. It may interest your readers to know that this stock is readily purchaseable, but not saleable, at 27 per cent. discount; and at the present moment I have some offered to me at that substantial reduction. I observe that it is stated the Council "are allowed a reduction of 25 per cent. off the gross price." The Council have to pay nearly, or quite, full price for the gas supplied for street lighting purposes; and it is only when gas is supplied to them in the future for their pumping-stations that they will be allowed 25 per cent. off the gross price, in respect of this latter item only.

I am amused to read that the "JOURNAL" would appear to endorse the idea that the Company are likely to get 28 to 30 years' purchase for the undertaking based on hypothetical profits. I observe that the Croydon Gas Company are open to receive tenders for their "C" stock, which for the past nine years has paid a dividend of 9 per cent., at a minimum of 180 per cent., which I make to be 20 years' purchase. The West Ham Gas Company have fixed the minimum price of issue of their 5 per cent. *preference* stock at 110 per cent., equal to 22 years' purchase. I was under the impression that both these places were rapidly-growing boroughs near London; but perhaps their rateable value is only growing at the rate of £100 a year, and hence the reason why they are modest enough to expect 25 per cent. less than "the pretty little village of Rickmansworth." The rest of the same paragraph seems to be somewhat jumbled, as it would almost read as if Mr. Henry Hill has "time after time" drawn the attention of the Urban Council to the impossibility of purifying the gas, and the Council ignored his advice. If Mr. Hill has time after time drawn attention to the matter, and the Directors of the Gas Company have taken no notice of it, the proper assumption would be that either the Directors thought it unnecessary or else they are to blame for neglecting the advice. I understand that during the last few months larger purifiers have been put in; but the Urban Council have had as much or as little to do with it as any one of your readers who has never heard of Rickmansworth before.

The subsequent addition to the article is, I consider, even more extraordinary than the article itself. As regards the incident of the estimate, I may observe that Mr. Hill told me himself that the Gas Company would not tender for the supply of the meters; and yet, when the tender came in, it included these very items which he could not supply and was not invited to supply. The article states that he was asked to estimate for the supplying and fixing of "all valves, meters, and connections," whereas as a matter of fact he was asked to tender for the "laying of the mains with the necessary connections, fittings, &c." In the opinion of our Engineer, the price named was a good deal too high; and the Contractors for the sewerage works were invited to tender for the whole work, including the supply of meters. I am told that the 200-light meter was sent off by the makers with gas in it; but that no

advice was sent calling attention to the fact. The result was that, when fixing the meter, there was an explosion, but fortunately no one was seriously hurt. I fail, however, to understand what the reference "to the laying of three-fourths of the service, and filling it in without giving Mr. Hill any chance to inspect the work," has to do with the matter. This service was not connected to the Gas Company's main, or anywhere near it. In fact, the request to Mr. Hill to connect the gas-main with the service was given by me on the afternoon of Saturday, the 14th inst., some eight days after the explosion; and I believe the work is not yet commenced by the Gas Company. Naturally, the local paper reported the occurrence, and added this remark: "It appears to be customary after testing a meter to leave gas in it." I thought that the contrary was the case; and, meeting the reporter, I asked him his authority for the statement. He assured me it was a gas expert; and, on my pressing him for the name, he told me that it was Mr. Henry Hill. Whether this is the case, I know not; but probably your readers would know. I understand that the London and North-Western Railway Company are inquiring into the matter; and this would hardly be the case if it were "customary" to leave gas in a meter. The loss will not fall upon the Council or (more properly) the ratepayers; but I refrain from mentioning "how much the Council saved by their refusal to accept the tender prepared by Mr. Hill."

The reference in your "Editorial Notes" to two members who are said not to "personally pay rent, rates, or taxes," whether correct or not, I regard as unworthy of the "JOURNAL." I believe—though perhaps I may be wrong—that the Prime Minister does not pay either rent or rates for his official residence, and probably this is so with other members of the Government; and yet no one in the Houses of Parliament uses this as an argument against them.

In conclusion, I venture to protest against the whole tone of the article and the comments upon it. The Urban Council as a public body must expect to be criticized, and even severely criticized; but it is entitled to have the facts stated fairly. I have to apologize for taking up so much of your space; but had I attempted to deal with all the inaccuracies, my letter would have been as long again.

H. LOMAS,
Clerk to the Rickmansworth Urban District Council.

Rickmansworth, Nov. 16, 1903.

[In publishing the above letter, we must express regret that it did not come to hand in time for inclusion in last week's "JOURNAL," when the matter to which our correspondent calls attention would have been fresher in the minds of readers. Thanks are due to Mr. Lomas for the full manner with which he has dealt with the gas question from the Council's point of view—and especially for pointing out the error into which he says we fell when stating that the rateable value of Rickmansworth was only growing by about £200 a year. But we really think he is mistaken in regarding the matter with which we dealt generally (and with which he now also deals) as being, "as it were, *sub judice*." The Council are bound by the terms of their Act of last session to purchase the gas undertaking; and the present, or possible future, results of this policy (thus finally decided upon), are therefore perfectly legitimate matters for outside discussion. We must endeavour to bear the strictures which our correspondent passes upon ourselves; but it is greatly to be regretted that, not content with these, he has so far allowed his feelings to get the better of his judgment as to accuse (by implication) a Parliamentary Committee of conniving at a piece of "financial juggling" with regard to the Company's stock-conversion scheme. Such a statement as this appears to us to be infinitely more serious than anything that can possibly be urged against the article about which we are so severely taken to task. Coming to the next paragraph of the letter, it seems hardly necessary to point out that the article in question did not express any opinion as to whether the Company were likely to obtain 28 or 30 years' purchase of "hypothetical profits;" we merely considered what might possibly happen *if the hopes of the Company were realized*. It is evident that our correspondent (for a legal gentleman) has devoted a considerable amount of attention to gas matters, though we fail to appreciate the precise relationship between the stock issues to which he refers and the compulsory purchase as a going concern of a gas undertaking. As to the unfortunate gas explosion incident, it is at least a fair assumption that if the meter had been fixed by men thoroughly accustomed to such work, the accident would have been avoided. This was our point; and it is emphasized by Mr. Lomas's explanation. If men used to this work had been employed, they would at any rate have been aware of the possibility of gas remaining in the meter from the testing process. Further on, Mr. Lomas regards as "unworthy of the 'JOURNAL'" the reference in the "Editorial Note" to the fact that two members of the Council were said not to "personally pay rent, rates, or taxes." Nothing whatever was even hinted at against these particular gentlemen, who, for aught we know to the contrary, may be quite comparable with the Prime Minister and "other members of the Government." But, regarding the matter from a general standpoint, we do think that the persons who may be responsible for increasing the liabilities of a community should be individually pecuniarily interested in the result. This may be a mistaken opinion; but we hold to it. Our correspondent's argument on this point is, however, so totally inapplicable to the case in question, that it is unnecessary for us to occupy space in dealing with it.—ED. J.G.L.]

LEGAL INTELLIGENCE.

WHITECHAPEL COUNTY COURT.—Friday, Nov. 13.

(*Before His Honour Judge* BACON.)

The Commercial Gas Company Wrongfully Charged with Neglect.

To-day the Commercial Gas Company were sued by Mr. D. Isaacs, boot manufacturer, of No. 125, Commercial Road, E., for £15, damages alleged to have been sustained by him through the neglect of one of the Company's servants.

Mr. B. JACOBS appeared for the plaintiff; Mr. R. F. COLAM (the Recorder of Croydon) represented the defendants.

Mr. JACOBS said the action had been brought for trespass and negligence in respect of the house No. 49, Bancroft Road, which plaintiff formerly occupied. He ceased to reside there on the 13th of August; and on the 11th or 12th he sent a post-card to the Company informing them that he was about to leave, and asking them to send someone before twelve o'clock on the 13th to take the reading of the gas-meter. Plaintiff left the house on the 13th at 12.30; but up to that time no one had appeared. The premises were left securely fastened; the gas-fittings and some furniture remaining inside. The following day plaintiff called at the house for his goods, and found the door open, and the windows on the ground floor smashed and open; also that the gas-fittings, chandeliers, and pipes had been destroyed. The gas had been cut off. The plaintiff alleged that the damage done was the result of negligence on the part of defendants' servant, who, he said, called after 12.30 on the 13th, and, finding the premises unoccupied, broke them open, cut off the gas, and went out by the area door, leaving it open. Then it was suggested some roughs or children made their way into the place, and did the damage. Plaintiff, however, had to rely almost entirely upon the admission of the defendants' man.

Plaintiff gave evidence bearing out his Counsel's statement. He said that when he returned to the house on the 14th he found a police constable outside, who asked him if he had left the house in the condition it was. Four chandeliers were damaged, pipes were broken off, and a bracket in the kitchen was pulled down. All the fittings were destroyed. When witness saw the man from the Gas Company, he stated that he got in by the area window and left by the door, which he closed behind him. Witness declared that it was impossible to shut the door from the outside without a key, and when three men from the Company tried to do it they failed.

In cross-examination by Mr. COLAM, witness denied that the damage to the window was done before he left the house.

Replying to his HONOUR, witness said he did not accuse the Company's man of breaking the fittings, but of leaving the door open.

Mr. COLAM remarked that the landlord of the house was making a claim against the defendants for the gas-fittings, while plaintiff represented them as being his own.

Witness replied that the landlord held him responsible for them.

Mr. COLAM submitted that there was no case, even if his Honour believed the whole of the story that had been told. The defendants had a legal right to enter the house; the gas agreement giving them access to it at all reasonable hours. There could be no question of trespass, as they were there by invitation.

William Littlejohn, an inspector in the service of the Company, said he went to No. 49, Bancroft Road, on the 13th of August, and found the house unoccupied. A window in the area was open and smashed. As there was a smell of gas, he entered the house by the window, closing it behind him, and making it more secure by putting up the shutters. Having disconnected the meter, he left by the area door, which he shut behind him—trying it to see that it was fastened.

Cross-examined by Mr. JACOBS, witness said the gas was not turned off when he went to the house. On examining the door afterwards, he closed it; and what plaintiff had said was untrue.

His HONOUR, without hearing any more witnesses for the defence, gave judgment for the Company.

Action Regarding a Gas Explosion.

In the Court of Appeal on the 11th inst., an appeal was heard in an action which was tried before Mr. Justice Darling and a Common Jury in May last, in which Mr. J. Ruffa sought to recover damages for injuries sustained through the alleged negligence of the servants of Mr. F. G. Minter, a builder. In the result, as reported in the "JOURNAL" at the time, the Jury found for the defendant; and judgment was given accordingly, with costs. Execution was, however, stayed in view of an appeal. The plaintiff was Manager of the United Carlo Gatti, Stevenson, and Slaters, Limited, ice merchants, and the defendant was employed to remove some gas fittings (one of which was a telescopic gaselier) from the Company's premises, and put them up in the plaintiff's house, a short distance away, at Peckham. It was alleged on the part of the plaintiff that the gaselier had been put up, and left, with the gas turned on at the meter, without any water in the tube; and when next morning he struck a match for the purpose of lighting the gas to see if it was satisfactory, a violent explosion occurred, and he was seriously injured. The evidence was rather conflicting—some witnesses saying that there was no water either in the gaselier or in a similar one in an adjoining room; while the man who did the work said the tube was wet, which showed that there had been water in it. He also said he went on the morning of the accident, before it occurred, to see that all was right; and having first lit all the burners, he turned them off, and watched the meter for a quarter of an hour, and there was no motion on the dial. The ground of the appeal was that the verdict was against the weight of evidence; and the plaintiff asked for judgment or a new trial. After argument, their Lordships dismissed the appeal, with costs, holding that there was evidence before the Jury, on which reasonable men could come to the decision they did.

MISCELLANEOUS NEWS.

PROPOSED GAS LEGISLATION FOR SOUTH LONDON.

Crystal Palace and Croydon Gas Companies' Parliamentary Notices.

In accordance with the opinion generally held at the close of the proceedings on the Bill promoted by the Crystal Palace District Gas Company last session, notice has been given of their intention to make application next year for the powers they failed to obtain. It is proposed to change the name to that of "The South Suburban Gas Company," or such other as may be defined in the Bill; also to alter the provisions of the Company's Acts of 1873 and 1893 with respect to the quality of gas to be supplied, both as regards its illuminating power and the sulphur compounds other than sulphuretted hydrogen, and to repeal the provisions of these Acts with respect to the removal of such compounds. Provision is to be made for the Company supplying to their consumers who may require them burners suitable for the proper consumption of gas of the proposed illuminating power, and also for testing the gas for this and for purity. New provisions are to be made with respect to the sliding-scale of price and dividend, and the variation of the dividend in accordance with the increase or decrease in the price of gas, so as to make it dependent upon the amount charged in any half year instead of in any year; and the provisions applicable to the payment of dividends by the Company are to be altered. It is intended to provide for the protection of the Company's mains, pipes, and apparatus from injury or damage resulting from fusion or electrolytic action caused by any electric currents generated or used for power, traction, lighting, or other purposes. Parliament will be asked to enact that the Urban District Council of Beckenham shall so fix the charges to be made by them for the supply of electric energy that the revenue derived in any year from their undertaking shall not be less than the expenditure for that year in respect thereof or attributable thereto. Other provisions of the Bill will relate to the issue and sale of stock to consumers or to persons in the employ of the Company, and to the election by the latter of a representative on the Board.

Another South London Company—the Croydon—are going to Parliament for authority to change their name to that of "The Croydon Gas Company," and to raise further capital. It is proposed to construct additional works on certain lands specified, and to purchase other lands. In the Bill to be promoted, provisions will be included to sanction the formation and application of a renewal fund, the issue of shares or stock to consumers and employees, the adoption of a sliding-scale of price and dividend, the supply of fittings and apparatus, and other matters.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES in the chair.

The SECRETARY (Mr. H. J. Luff) read the notice convening the meeting; and the Directors' report and the accounts—to which reference was made last week—were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, since the proprietors last met, there had been a good many changes in connection with the Company, some of which were alluded to in the Directors' report. The first paragraph referred to the alteration in the method of calculating the value of the rupee—a subject upon which he remarked at the last general meeting. The paragraph stated that the steadiness of the Indian Exchange which had ruled during the past few years had rendered the financial year 1902-3 a fit period at which to effect the conversion of the Company's accounts from the value-basis of 2s. to the rupee to that which, as nearly as might be, represented its actual value—viz., 16d. to the rupee. The present statement of accounts was therefore based upon the rupee value of 16d. The only two items in the balance-sheet which had not been adjusted to the 16d. rate of exchange were the expenditure on capital account (£341,876), and the outlay on public lamps. The latter was practically a suspense account, of which £2500 had been written off this year, and the balance would, the Directors hoped, be extinguished in the next four or five years. The statement of expenditure on capital account was, he believed, somewhat misleading. Since 1897, this item had not been increased; but, prior to that date, expenditure for new plant was partly for materials purchased in England, and partly for wages and materials paid for in Calcutta. The latter, being calculated at 2s. to the rupee, enhanced the outlay beyond its actual value; but against this excess there had been, from time to time, additions made to the depreciation account, which now stood at £50,000. He thought himself that it would be preferable to reduce the £341,876 to £291,876; and the outlay on capital account would then be equal to nearly 25s. 10d. per 1000 cubic feet of gas sold. The next paragraph in the report referred also to the rate of exchange, which, being favourable, had resulted in £47 2s. 11d. being added to the exchange equalization account, increasing that account from £7280 to £7327. The same paragraph stated that the revenue account for the financial year showed a gratifying increase of £3000 in the gas-rental; and there was a small increase in the amount realized by residual products. The £3000 included rather more than £2000 increased revenue from public lighting, in the charge for which was embraced not only the cost of gas consumed, but other items, such as lamp-lighting and repairs, a portion of the outlay for conversion of the lamps to the incandescent system, and the maintenance of mantles. The consumption of gas for public and private lighting during the past year was 3½ per cent. in excess of that for the year preceding. In the next paragraph, the Directors reported, with much regret, that the state of health of Mr. David Coats Niven, the Engineer and Manager of the Company in Calcutta since 1882, precluded him from continuing his services to the Company. While accepting the resignation tendered by Mr. Niven, the Directors had made to him a suitable recognition of his services. They had appointed in his place Mr. James Clarke Watson, who for nearly seven years past had been the Assistant Engineer and Manager in Calcutta; and, in the place of Mr. Watson, they had appointed Mr. J. W. Mackay, recently Works Manager at Rochester. He (the Chairman) might say that the Directors believed they had, in Mr. Watson, a most capable and efficient Engineer and General Manager, and that he would be ably assisted by Mr. Mackay, so that several improvements which had long been delayed would now be carried out. In addition to Mr. Mackay, the Board had sent out Mr. Shipp (formerly at Bristol) as Outdoor Superintendent; and Mr. Park (from Carlisle) as foreman of the meter and fitters' shops. With four Englishmen in the service of the Company in Calcutta, the Directors looked forward to increased business, and to even more satisfactory results than had been attained in the past; and he (the Chairman) hoped, if spared to have the pleasure of meeting the proprietors again next year, to have the gratification of telling them what improvements had been effected under the new management. He might, however, mention two matters. In the autumn of last year, the Directors thought it very desirable to show Calcutta what could be done in improved public lighting by gas; and so they sent out half-a-dozen "Lucas" lamps, the erection of which, however, was delayed until Mr. Watson took charge of the works as Acting Manager. These lamps, with others which had since been sent out, had given, and were giving, the greatest satisfaction—proving that gas was the best illuminant for public lighting, when burned in modern high-power lamps. Mr. Watson had judiciously erected the lamps (with the concurrence of the several local authorities) in the most prominent positions in the public thoroughfares in Calcutta and Howrah and at Balliaghatta Railway Station, with the result that orders for high-power lamps were increasing. The long-delayed wish of the Board to have a show-room in the centre of the city was now *un fait accompli*. Mr. Watson had, with the approval of the Board, negotiated for a lease of a portion of the newly-erected premises occupied by the Young Men's Christian Association in Chowringhee Road. The Company took possession on Oct. 1; and there they would have a show-room in the best thoroughfare, with accommodation for the clerical staff of the rental department, so that the consumers could in future be attended to from this centrally-situated office, instead of having to plod to the gas-works, which were a couple of miles away on the outskirts of the town. The proprietors would notice that, in the certificate which had been read, the Auditors emphasized the fact that the investments were included in the balance-sheet at cost price. He need not dwell on the familiar fact that all gilt-edged securities had depreciated in value during the past five years or so. The Company's securities had been re-valued at Stock Exchange quotations as on June 30 last; and they found the depreciation in value to be £3068. The Directors hoped there might be a recovery in prices during the current financial year, so as not to necessitate any reduction in the valuation of the securities in the next balance-sheet.

Mr H. D. ELLIS seconded the motion, which was unanimously agreed to without discussion.

Proposed by the CHAIRMAN, and seconded by Mr. H. A. WAKEMAN-NEWPORT, a dividend of 4½ per cent. (free of income-tax) was declared; making 8 per cent. for the year.

On the motion of the CHAIRMAN, seconded by Mr. W. WILLIAMS, the retiring Director (Mr. A. T. Eastman) was re-elected.

The Auditors (Messrs. S. W. Savage and F. Seel) were reappointed, on the proposition of Mr. WAKEMAN-NEWPORT, seconded by Mr. G. F. THOMPSON.

Mr. R. MILLER said the Chairman had asked him to propose a special complimentary resolution, conveying the proprietors' best wishes to the Engineer and General Manager in Calcutta (Mr. J. C. Watson). He undertook the duty with very great pleasure, inasmuch as he had the opportunity, when in Calcutta in the early part of the year, of seeing the Company's works and Mr. Watson for the second time. He felt perfectly confident that the interests of the proprietors were in safe hands. Mr. Watson was a methodical and thoughtful man; and his experience of seven years in their works would certainly fit him to undertake the onerous and responsible post of Engineer and General Manager. He was a most competent and careful man; and his ambition in life was to be a successful General Manager of the Oriental Gas Company. He therefore proposed with pleasure—"That the proprietors desire to convey their best wishes to their Engineer and General Manager (Mr. J. C. Watson); and they trust the good health he has hitherto enjoyed may continue, and that his efforts to promote the welfare of the Company may be crowned with success."

Mr. EASTMAN, in seconding the motion, said it would be obvious to the proprietors that a man who was stepping from a subordinate position into the command of an important undertaking would feel strengthened if he had an assurance of the goodwill of the general body of proprietors. The resolution would strengthen his hands, and this would add to the already favourable prospect of successful results from the efforts he had commenced to make. Mr. Watson had an advantage in this respect, that, instead of going out as an entire stranger to take up the reins of government, he had already all the reins in his hands, having served the Company for many years.

The CHAIRMAN having added that he had every confidence in Mr. Watson's ability to represent the Company in Calcutta,

The resolution was very heartily agreed to.

On the motion of Mr. ELLIS, seconded by Mr. WILLIAMS, the assiduous services of the Secretary and staff in London (mention being made by the proposer of Mr. Luff's assistant, Mr. Rainer) and of the staff in Calcutta were cordially acknowledged.

Mr. LUFF responded on behalf of himself, Mr. Watson, and their respective staffs.

Moved by Mr. E. F. WHITE, and seconded by Mr. THOMPSON, the Chairman and Directors were thanked for their efficient services.

The CHAIRMAN replied to the expression of goodwill—adding that the Board had had a considerable amount of anxiety in re-arranging their official representation in Calcutta; but they looked forward with very great confidence to the future.

This concluded the proceedings.

METROPOLITAN WATER ARBITRATION.

(*Before the Right Hon. Sir* EDWARD FRY, *Sir* HUGH OWEN, G.C.B., *and Sir* JOHN WOLFE-BARRY, K.C.B.)

Close of the East London Case—Opening of the New River Company's Case.

Twelfth Day—Monday, Nov. 16.

The Commissioners resumed their sittings to-day, when the case of the East London Company was proceeded with.

Mr. BALFOUR BROWNE stated that since the adjournment he had had an opportunity of considering whether it would be necessary to ask the Court to hear any rebutting evidence to the case put forward by the Metropolitan Water Board; and he and his learned friends had come to the conclusion that it was unnecessary. He then put in tables showing the effect of the sinking fund upon the future profits of the Company. The net maintainable income was £165,000 in the original table; but, owing to the sinking fund and the 1 per cent. for management coming off, the figure was reduced to £144,653. This, multiplied by 36·36, came to £5,260,000; and the whole total of the claim amounted now to £6,417,889. They also claimed 1 per cent. for the cost of reinvestment. They had drawn up a table showing, in regard to remunerative and unremunerative houses, the result of the last three years. It was found that in 1900 the average per house connected realized £1 4s. 4¾d.; in 1901, it amounted to £1 5s. 7¼d.; and last year, £1 7s. 3½d. Therefore the ratio did not remain the same, but became more favourable to the Companies, though in their tables they had taken it as if the ratio of remunerative to unremunerative remained precisely the same.

Mr. MOULTON then summed up the case on behalf of the Water Board. He contended that it was not an ordinary case of the sale of water-works. The London Water-Works had for the last twenty years been treated by the Legislature in a special way; the legislation had been of quite a peculiar character. The tribunal was now dealing with the Company whose failures in the all-important duty of supplying London with water had really, more than any other matter, led to the Water Board being constituted. In 1895, when frost brought trouble on the Company, and then later on when drought came, the people were first of all face to face with a Company which could not meet its statutory obligations. Although he was not going to rely upon it, he thought that the onus was upon the Company to show that it was not now practically at the end of its resources. The Company was certainly now paying its dividend, and the accounts of 1902 were before the Court; but neither side could pretend that these accounts, and the circumstances of 1902, foreshadowed what was going to happen afterwards. He asked the tribunal first to look at the resources of the Company, and then at its duties and obligations. After this, he would try to show what, financially, the future would be, even if the Company went on with all its present powers for the purpose of carrying on the undertaking. He would then deal with the effect of the terms on which it possessed these powers, and the effect of the sterilization clause, which was the condition on which Parliament relieved the Company in 1899-1900. Finally, he would draw attention to the financial considerations. Dealing first with the engineering part of the case, Counsel said the sources were, of course, statutory—the Lea, the Thames, and the wells. The amount the Company could draw from the Thames was a definite fixed quantity of 10 million gallons a day. The wells there were in the gravel bed, which dealt really with surface drainage; and one could not help feeling that the wells were likely to become at some time seriously polluted. In the case of the Lea, the water was substantially divided between two Companies—he might also go further, and say not only the water of the Lea, but the water of the Lea Valley; and with regard to the methods in which the water of the Lea Valley was made use of by the Companies, the New River Company had unquestionably the first call. It took its water from the Lea itself, just below Hertford, at a place far higher than the intakes of the East London Company. It had a right to take up to 22½ million gallons; the only restriction being that it was to allow to run by its intake 3,600,000 gallons for the purpose of navigation. Its wells were mostly on the upper part of the river; whereas those of the East London Company were lower down the valley. The East London Company's rights were nominally to take 22½ million gallons from the Lea, if it was there. After this, the two had the right to divide whatever water there was in the river that was not used for navigation purposes. The question of the wells had been much debated. The Balfour Commission represented the high-water mark of the reputation of the wells. They sent a Commissioner down, who practically said that the wells might go on pumping as hard as they liked without making any difference; he thought there was a gigantic underground river flowing through the chalk, and wasting its sweetness in the sea. He based this opinion mainly upon the fact that no wells were failing from having their rest level depressed; and that no springs were in any way affected or changed from what they had been from time immemorial. The Commission accepted this, and seemed to have thought there was an inexhaustible supply of water to be got from the ground. This was a delusion not peculiar to the Lea Valley. The Court, according to his contention, had no right to assume that there would be any increase in the supply of water from the wells. It had now been established that the level of the wells was below that of the draining river—the sea. It was clear, therefore, that the Company had been pumping beyond the capacity of the wells, and drawing off water which ought to have gone into the sea. The effect of this was to lower the underground level of the water supply, and was responsible for the gradual change which had taken place underground in the watershed. The Company were asking for compensation; and the compensation must depend upon the amount of supply they possessed in order to carry out their obligations. Therefore the future had to be looked to. Although one had, of course, to regard the present for the purpose of getting at the future, it was no use the Company saying that they had now enough water to supply the present population, and therefore they must be treated as having a well-secured income. The Company might be just at the limits of their powers, and the increase of the population would soon carry them beyond their powers; so that they would soon be unable to fulfil their statutory obligations. He had the greatest difficulty in understanding Mr. Bryan's evidence upon the point of supplies. Mr. Bryan had over-estimated the census population; and it was by means of this fact that he got his amount as under 30 gallons per head. Taking the census figures, it amounted to 30 gallons per head. All Mr. Bryan's figures on this point were obtained by multiplying the supplies by 6·62.

Mr. *W. B. Bryan* was then recalled, at the suggestion of the PRESIDENT, and questioned with regard to his Table A.

Mr. MOULTON: I put it to you that the estimated population in Table A is obtained by multiplying the number of supplies by 6·62?

Witness: No; it is not.

Were all the other figures from 1892 to 1901 obtained by multiplying the supplies by 6·62?—No; the actual figures were taken at the census of 1891, and the actual census figures inside London of 1896. Then the figures were corrected from our estimates between these periods. We had to correct them between the periods of the quinquennial census in London and the decennial census outside London.

From 1892 to 1896, the figures were obtained by multiplying the supplies by 6·62?—Whatever the multiplier was. If you tell me that is it, I will take it.

From 1896 to 1901 the same factor is used, 6·62?—Yes.

And in 1902 you still multiplied by 6·62?—No; we did not. We took the population inside London as a constant. Outside London the factor is 5 85.

In re-examination by Mr. BALFOUR BROWNE, witness said that the estimated population in the whole district in 1901 was 1,417,408. This was the average of the months added together and divided by 12.

Mr. BALFOUR BROWNE: You have always assumed that there would be 5·85 people to each supply, and you have added that to your column in the table?

Witness: Yes.

And, throughout, this is the way the population has been arrived at?—Yes.

Mr. MOULTON said his learned friend had got again from Mr. Bryan that he obtained the 1902 population by taking the 1901 population and adding 5·85 times the number of new supplies. Mr. Bryan did not; he obtained them by adding 6·62 times the number of new supplies. The census had not been touched. It was impossible to say that 6·62—the figure arrived at in 1892 as the relation between the supplies and population—could be applied all through ten years, and come right at the end of that time, and required no correction by census returns. Mr. Bryan said he obtained the 1902 population by adding 5·85 times the number of new supplies to the 1901 population. He (Counsel) had taken it out. There were 5105 new supplies; the population average was 38,799. Dividing one into the other, he got 6·62, which the witness said was 5·85. The importance of the point was that the 6·62 had been taken all through the ten years. This led to an over-estimate of the population. Counsel contended that the universal experience in London had been a supply per head of over 30 gallons. The Balfour Commission put it at 35 gallons per head; but it might be said that they would take a liberal estimate, and the Water Board were not suggesting that 35 should be taken as the measure of the obligation. The consumption of water per head inside London would probably increase.

Thirteenth Day—Tuesday, Nov. 17.

Mr. BALFOUR BROWNE, for the East London Company, said he desired to correct an error in the evidence given by Mr. Bryan, their Engineer, who had computed the outside London population in the Company's district at 611,225. The figure ought to have been 617,611.

Mr. MOULTON, resuming his address on behalf of the Water Board, in reply to the case of the East London Company, said he had been reminded, in dealing with the obligations of the Companies, that he ought to have called the attention of the Court also to the obligations under the Metropolis Water Act of 1871. Section 6 said that from and after the passing of the Act, every Company should on Sundays, as on other days, supply sufficient pure and wholesome water for the domestic use of the inhabitants within their water limits. Now whether this was construed as extending to Sunday what existed on other days, or whether it was a specific enactment with regard to all the days, it was perfectly clear that the Act regarded it as a duty on each Company to supply pure and wholesome water for the domestic use of the inhabitants. Then there was a clause dealing with constant supply, which said that the Companies should provide a constant supply of pure and wholesome water sufficient for the domestic purposes of the inhabitants within their water limits—constantly laid on at such pressure as would make the water reach the top storey of the the highest houses within their limits, but not exceeding the limit prescribed in the Special Acts of the Company. He had not called attention to this specially before, because this Company did give a constant supply to the greater part, if not the whole, of their district. He only pointed out that the enactment was quite specific—that they had to give, and to continue to give, this supply of water. This, of course, was throughout the district; and therefore it applied to all parts, whether built upon or not. He wanted now to go to a very important question—namely, whether or not the water resources of the Company were sterilized. He wished to consider the tenure under which the Company held these resources, and to what extent they could be considered in estimating the compensation to be given. He would deal with the provisions of two statutes—the Intercommunication Act of 1899 and the East London Act of 1900. The former was an exceedingly important Act for the Companies, and one the effect of which on the present occasion was to be most carefully considered. The report of the Llandaff Commission showed the pressure there was for immediate action by reason of the failures of the Company to supply the community with water; and they considered what was to be done. They put forward a first report dealing solely with the steps to be taken immediately to prevent

the possibility of another water famine. It became obvious that the only scheme which at the moment could save such a district as the East London was one whereby the whole of the resources of London could be brought to remedy the failure of any one Company in its own special area. It was found that they must carry out such works as must make a joint affair of the whole of the London Companies, in order that the surplus of one might be applied to the deficiencies of the others. This implied, first, the construction of works which would enable the surplus of the one Company to be passed over to the district of another; and, secondly, statutory powers which would legalize the construction of such works and the transfer of such water. In dealing with the question of intercommunication of the water systems, they had assumed that a connection was implied of such a nature that the Companies could transfer *inter se* such a supply of water as they respectively commanded, without affecting the sufficient supply which was requisite to the wants of their own district. He brought before the Court the report of the Llandaff Commission, as showing that at all events in their minds there was an idea of an intercommunication scheme.

The PRESIDENT: It is not what the Llandaff Commission thought, but what the Legislature thought.

Mr. MOULTON said he quoted the Act in order to show that it carried out the idea.

The PRESIDENT: Then it is the Act, and not the report. I do not want to stop you; but our attention has before been called to the provisions of the Act. We are not quite new to it.

Mr. MOULTON said he was aware of that; but he had desired to call attention to the provisions in order to show, first, the complete sterilization of all the consequences of the Act, and, secondly, what those consequences were, because he gathered from his Lordship's remarks that he was going to suggest that it was not under this Act that the transference of water had taken place. He was going to show that this transference of water had taken place under it.

The PRESIDENT: I think we know that the transference has been made by a main, the construction of which was begun before the Act, but the expenditure on which was justified by the Act. Is that not so?

Mr. MOULTON replied that it was. He wanted to show that all the water transferred, or that could be transferred, from one Company to another must be transferred by works carried out under the Intercommunication Act. Having alluded to the works, Counsel urged that it was quite clear they were sterilized, were under the Intercommunication Act, and therefore the advantages to be derived from them could not be taken into account. The reason he dwelt upon this point was that he had heard his Lordship again and again say there were powers possessed by the Companies of selling water one to the other quite independent of intercommunication. He now turned to the 1900 Act of the East London Company, for the purpose of considering the extent and nature of the sterilization there. Under the care of the Local Government Board, it had been very usual now in Acts of Parliament giving powers to water companies precisely to allocate the purposes for which the capital powers were granted; and under section 46 of the Act that was done. There was £1,340,000 for, or in connection with, reservoirs and works incidental thereto, &c. Adding up the sums, one saw that the total of £1,800,000 left a balance of £160,000. They had £200,000 for mains, £100,000 for machinery, £1,340,000 applicable to reservoirs, and £160,000 balance applicable generally. The capital powers of the 1900 Act were given subject to the sterilization clause. The reservoirs which were proposed to be made were sterilized. As to the wells, five of them were treated by the Company as being an outlay of unproductive capital—that was, capital which had not yet become productive. They now understood how it was that Mr. Bryan claimed such a large amount for the wells in the future. The reason why there was a justification for it—if there was a justification—was that there were very large capital outlays upon the wells for the purpose of making them give a larger output, and further machinery had been erected for the purpose of extra pumping. But all this had been done under the powers of the 1900 Act. The capital powers of the 1900 Act were given subject to the sterilization clause; and all this extra for the wells must be treated as the extra for the reservoirs, and that it must be considered to have been obtained under the forms of the sterilization clause. He had dealt with the resources, quantities, and nature of the water; and the status the Company had with regard to the sterilization clause. So far he had been dealing with the wealth of the Company in water. He now turned to the equivalent of that in money. Let them consider what the resources of the Company were in the way of income, and for their particular purposes in the way of surplus income, because the income of the Company was weighted by a first charge of a very large amount of existing debentures, and probably a very much larger amount of debentures which they had powers to issue, and which they must issue. An elaborate table had been put in, and agreed to by the Accountants, showing the figures of income of the Company for the year 1902; and also a table of previous years. Though this account was agreed as a question of figures by the Accountants, each Accountant took exceptions to it as a complete account of the income of the Company by reason of items of surcharge, and some that ought to be struck out. If he had gathered aright the view of the tribunal, it was that adjusting the figures for 1902 was not the most satisfactory way of arriving at what might be called the present income of the Company. In any case, 1902 must, like any other year, have its special features; and if they were to claim to alter the special features of every year, they would be entering into an inquiry which was of a very speculative character. He understood the tribunal thought it was much the best way to let the special features of any particular year be eliminated by a process of average, and that an average of ten years should be taken.

The PRESIDENT: The average of the ten years is higher than last year.

Mr. MOULTON thought it was decidedly higher, and proceeded to take the average for the last ten years, which, he said, after all, only gave them a starting point; and they had to consider what the very much altered conditions of the future would lead to. Having dealt with the conditions of the past, Counsel said the conditions of the future differed from those of the past much to the disfavour of the Company. The supply would be more costly, they had to consider the sterilization clause, they could not look in the future to any pecuniary advantages from the increased size of the works, and there was further the matters of the sinking fund. As to the question of what would be the surplus, they assumed that the reservoirs of 1900 must be made, because they applied for, and obtained, powers from Parliament to build them. If they did that, the sinking fund and interest would be largely increased. Counsel next dealt with the way in which the gross water-rental, less empties, and the profit on trading had been dealt with by the evidence for the Company; and forecasting the circumstances of the future, he said the allowance made for increase of net rental was a very ample one, and what they got was this: The dividend was falling from 7 to about 5·76 per cent. in 1910, and slightly falling down to 1914—a direct influence of the heavy payments to the sinking fund and interest. The phrase "maintainable income" had been used very frequently during this inquiry. It was a very useful phrase, and a very useful idea; but it might be very dangerous unless it was extremely clear. He submitted that the doctrine of "maintainable income" did not apply to the Company at all. They had got to face a far more difficult question—the value of a decreasing income. Counsel next examined the meaning of "maintainable income," and what its effect was on the capital value of a Company having a maintainable income. As to the water stock of the Company, they had a right to look at it as showing the esteem in which it was held by the public. It appeared to him that the reputation of a water stock that had been going on under favourable circumstances was likely to be considerably higher than its real value, especially when heavy payments not understood by the public—such as payments to the sinking fund—had been made. But it was more likely to be over-estimated when there were dangers arising from such legal difficulties as the sterilization clause, which the public would know nothing at all about. But even looking at the esteem in which it was held by the public, they found, from the tables put in by the Company, that the average return during the last four years was 3·6 per cent.; and looking only at other years, the average was about 3·11 and 3·12.

The PRESIDENT remarked that the market price was 205½ for the last five years.

Mr. MOULTON said it was based on the dividends and the experience of the past; whereas they knew there were dangers to be faced in the future, and that there had been less difficulties in the past. He went on to inquire how they ought to be affected in the number of years' purchase by the terms on which the Company had accepted their powers—namely sterilization—and also by the risks which the Company had in the future. They had to examine a diminishing income. He submitted that the real value of the Company was far less that the estimate of any number of years' purchase which would be given for a calculable income; and he asked the tribunal to say that the Company could show no stability in the future beyond the next few years.

Mr. BALFOUR BROWNE then commenced his address to the Court upon the whole case for the East London Company. He pointed out, in the first place, that after an inquiry it had been held (concerning the frost of 1895 and the subsequent drought) that the Company had not neglected their statutory obligations at all, and that the failure on their part was due to an unusual cause or accident. To say, as Mr. Moulton had said, that the failure had led to their being here to-day, was entirely erroneous; the Company had never failed in their statutory duties. With regard to the case put forward by Mr. Moulton, he had carefully listened to find out what he said their undertaking was worth; but he could not find it. In finding the value of the undertaking, they first ascertained what the total income was; and they deducted from that the interest paid upon debentures, because that was an obligation borne by the Company. The Court had said that the sinking fund and the 1 per cent. were in the same category as the interest on debentures. They had deducted these items; and this gave them the income that was divisible by the shareholders. "Maintainable income" was certainly a convenient phrase; but it was one very well understood indeed. What they wanted the tribunal to ascertain was what was their secured income. This had been done; and they could easily turn it into a capital sum. The present resources of the Company would carry them on without any difficulty until 1924. If so, although they had got the powers to make the new reservoirs, it would be absolute folly to build them; and their case was that in 1924 their powers would be exhausted.

Fourteenth Day—Thursday, Nov. 19.

Mr. BALFOUR BROWNE, resuming his address on behalf of the East London Company, said that on the previous occasion he was discussing the question as to what was the maintainable income of the Company, and directing the attention of the Court to the figures in Table X. There was one obvious error in the table which the Court, by its decision, had corrected. The first figure was £125,587, which was merely taken from the agreed accounts, and to this was added the amount of the sinking fund, which they said should not be deducted. The Court had declared that, so far as this Company was concerned, the sinking fund was a charge against the Company; and to this extent, of course, they had to correct their table. The second item was the interest on unproductive capital; and he could not add much to what he had already said on this matter. He could conceive that in one particular year he might have from any undertaking an income of £3000. He would take this figure as an illustration. If in that particular year he had put up a new reservoir costing £100,000, he would have to debit himself with interest at 3 per cent. on this—£3000; and in that year his shareholders would get no income whatever. His learned friend would say that, under these circumstances, they had no maintainable income at all, and the value of the concern was *nil*. This he could not conceive. To the value of the undertaking, which was worth £3000, he had added another reservoir, costing £100,000; and it was worth more than before, not less, although it was quite true the shareholders in that particular year might have no income whatever. Therefore the income of the undertaking was only one means

by which the Court could arrive at its value. If works were added, and capital expended upon them which was earning no income at all, it must be given to the Company somehow or other. If the Court decided that he was right as to unproductive capital, they could give him this unproductive capital in one of two ways—either by taking off the interest and capitalizing the income, or by giving back the money which had been expended on unproductive works. The latter was the more usual course. When they had arrived at the maintainable income and capitalized it, then the Engineers would look to see if there were any defects in the works. If there were, they would deduct for them; and if there was a surplus, they would allow for it. The Company said that their income in a particular year was depleted by interest upon unproductive capital. If this unproductive capital was taken away, their income would have been greater. Turning to the point of water purchased from other Companies, Counsel said that he was quite prepared to bear the burden of the new reservoirs; but he was not prepared to bear it and also the burden of the bought water. The Company made these reservoirs for the particular purpose of relieving themselves from the necessity of buying water. The past must be looked to to see what the future would produce. Suppose anything was put upon a company which never was in the past put upon them, was that to be ignored? Certainly not; and the decision of the Court with regard to the sinking fund was the best illustration he could take for the purpose. The Court had declared that the sinking fund was to be taken into account, because, although he did not bear it in the past, he would have to bear it in the future. He said they could eliminate the bought water. The average had no bearing if the burden was a new one which he never bore before. In every case his Engineers, although not heard on the point, were prepared to say that, applying averages correctly, it was a fair and proper principle in individual items which were sure to recur; but if it was not sure to recur, he asked the Court to eliminate it. The only argument which had oppressed him was one put by the President in a question to a witness —"It may be true this item will not appear in the accounts again; but some other may."

The PRESIDENT: Not "may"—will.

Mr. BALFOUR BROWNE said that no item could come in as against the £26,000 for bought water. If he could eliminate the risk of any extraordinary matter, he stood upon firm ground; and with regard to bought water, which was the only thing in question, he had eliminated that by his expenditure of £300,000 on new reservoirs. Mr. Moulton had asked the Court to look at the resources of the Company, at its obligations, at the financial aspect, the effect of the terms of the sterilization clause, and the finance and figure of compensation. He (Mr. Moulton) had not said anything about finance and the figure of compensation; but he had referred to the resources, and had stated that the duties and obligations of the Company had brought it to the end of its resources. This was not so. First the Company had been attacked as to quality.

The PRESIDENT: We do not want to hear you on quality.

Mr. BALFOUR BROWNE said he would pass on to quantity. They could take, not the 30 million gallons as stated by Sir Alexander Binnie, but 22 millions from the Lea, 20 millions from wells, 2 millions from the Hanworth Springs, and 10 millions from the Thames. This made a total of 54 million gallons a day. Their present supply was only some 40 millions. In 1912, according to their tables, they could get 46,700,000 gallons a day; and in 1924, they would be up to 53,732,000 gallons. His learned friend had assumed all through his argument that a water company was bound to supply everybody in its district, whether it had the water or the works or the money, or not. This was not so. The Company had always gone on trying to supply, because if they had not Parliament would have stepped in and allowed someone else to do so. In the second place, the supplies in future would increase the profits. The houses put up in the last three years had been more remunerative. But he denied legal obligation to supply.

The PRESIDENT asked what was the meaning of the words, in the recitals of the Acts, "unable to fulfil their statutory obligations."

Mr. BALFOUR BROWNE said they meant nothing. The recital of an Act of Parliament, put in by the Company itself, could not make an obligation unless another Act put it upon them. The Company had no obligation to go to Parliament to give it powers; Parliament was under no obligation to give the Company powers; and, worst of all, if they did, there was no obligation on the part of the public to raise the money. Turning to the more important question, had the Company with their present powers done their duty? He admitted that if they had the works and the water and failed to supply, they would be liable. Even if they had not the works, but had the money in hand and did not carry out the works, he thought they would be liable. Counsel then proceeded to show that the works had been carried out, and that the resources were ample to take the Company on till 1924. Their case was that they could supply water for their storage to the extent of 22 million gallons per day. Sometimes the Thames sent down in one day enough water to feed London for a whole year. The difficulty was that when the Lea or the Thames went down very low there was not sufficient; and in order to equalize matters, a certain storage was necessary. Sir Alexander Binnie's table was wrong in three respects: First, he had not allowed sufficient below Feilde's Weir, which would remove the deficit at the end; then he had treated the water as water to which the Company had no right, when they had in fact the right—this also would take away the alleged deficit; and he had not given credit for the 3,600,000 out of the 5,400,000 gallons. Under these circumstances, it came exactly to what Mr. Bryan had said—that if one took away the navigation water, there were from the River Lea 22½ million gallons a day available for supply, and there was ample storage to cover it during the longest period of drought. With regard to sterilization. As to intercommunication, he had dwelt on the fact that the Company had 54 million gallons, because, if so, the intercommunication did him no good. The intercommunication was, as his learned friend had shown, a bit of panic legislation. It was no good if the Company had enough water. The Company was not claiming anything for it. In conclusion, Counsel submitted that the figures he had put forward could be relied upon, and that there were good prospects before the Company.

After some discussion, it was decided that the question of agreement with regard to the liquidation expenses should be brought up on Saturday morning.

The PRESIDENT said the Court would consider their award.

The Court then proceeded with

THE NEW RIVER COMPANY'S CASE.

The Company's claim amounts to £11,550,000; and the offer of the Board is £3,000,000.

Mr. BALFOUR BROWNE, K.C., Mr. C. A. CRIPPS, K.C., M.P., Mr. CLAUDE BAGGALLAY, K.C., and Mr. F. W. PEMBER appeared for the Company.

Mr. BALFOUR BROWNE, in opening the case, said that a great deal that had been gone into in the previous inquiry affected the New River Company; and therefore the proceedings might be considerably shortened. But there were certain features in the present case which did not exist in the other Companies. Counsel dealt with the history of the Company, and enumerated their various Acts. In the Act of 1896, the sinking fund clause was first put upon the Company. In 1897, they had power to borrow by debenture stock £1,000,000, and again the sinking fund was put upon the Company; but there was no sterilization clause upon them at all. Of the three classes of shares, the King's shares were scattered in various hands; but the holders of Adventurers' shares were the Managers of the undertaking. The 29 adventurers were really the corporate body. The two classes of shares were real property, and entitled persons to a vote in the county of Middlesex; but the new shares were personal property. The New River Company was not only a Water Company, but a large Land Company, owning the Clerkenwell Estate and lands scattered all over the country. He understood that the Water Board desired to have these lands; and the Companies were quite prepared to pass them over. But in their view the lands formed no part of the water undertaking, and must be valued entirely separately from it.

The PRESIDENT: If these properties are part of the water undertaking, then there is the right to purchase.

Mr. BALFOUR BROWNE said that was so. He thought it must be a matter of agreement.

Mr. MOULTON said the Water Board claimed that the lands formed part of the undertaking which was to be purchased under the arbitration proceedings, and must be handed over to them.

Mr. BALFOUR BROWNE said it practically meant two arbitrations. The Court would probably find it the most convenient course first to determine the value of the undertaking in cash, and then the amount of the water stock they were to get for the cash. The New River was the only Company to be paid in water stock. Their claim was founded upon the income they derived, and also, to some extent, upon the income that they might have derived from the undertaking.

Fifteenth Day—Friday, Nov. 20.

Mr. BALFOUR BROWNE continued his opening speech on the New River Company's case. He based deductions on a mass of statistics as to what was the probable income of the Company, and contended that the undertaking should be taken over upon the figures for 1904. If he omitted the "D" stock, debentures to the value of £1,808,000 had been issued. In 1902, the total water-rental was £632,628, including the Company's adjustments and extra charges, and the expenses were £236,735; thus making the profit on water £415,893, from which must be subtracted the charges for the "King's Clog" and the "Hardwick Gift," in addition to interest on debentures and sinking fund. Therefore, there was a balance remaining of £341,589. The estimated capital expenditure to June 24, 1907 (the date to which the Company's claim for prospective value was made) was £1,904,000. The total amount of capital issued was £3,892,709, and the interest paid was £409,129; and 10¾ per cent. was about the average rate on all capital. It was computed by the Accountants that the divisible profit in 1904 would be £339,801, which would go on for all time; and if they were to multiply this amount by 36·36 years, they would get a capital sum of £12,356,400, which would be the cash value of the Company. Over £750,000 was also claimed for additional profits in respect of the next three years; so that the total capital account was brought up to £13,139,377. The Engineers had estimated for 1905-6-7; but the estimate was not based on so rapid an increase of profits as had been the case previously. The Company also asked for £115,241 and interest in respect of the Staines reservoirs. The amount of water per day available from the Company's sources of supply was 56,830,000 gallons.

A lengthy discussion ensued on a contention of the Water Board that, under the Water-Works Clauses Act of 1847, the Company were limited, in dividing their profits, to the maximum amount of the dividend on capital raised and expended.

The CHAIRMAN suggested that the Arbitrators would have to decide this point at once.

Mr. CRIPPS replied in the affirmative, and said it really went to the base of a great part of the claim. He contended that there was no restriction applicable to the New River Company. Up to 1852, when a New River Company Act was passed, they might charge what they pleased; but under that Act, their charges were limited, though only as regards domestic supply. They were left free to distribute as much of their profit as they liked. The clauses of the Water-Works Clauses Act, 1847, which were incorporated in that Act did not restrict them, excepting as he had said. The Water-Works Clauses Act differed from the Lands Clauses Act in that the clauses which were inserted had to be specifically defined. The Company also obtained an Act in 1866, which was a financial Act; and it was perfectly clear that the Water-Works Clauses Act did not apply to this. It had always been assumed up to that day that they were entitled, whatever their profit might be, to divide the whole of that profit, without any limitation, among the "adventurers" and shareholders of the Company.

Mr. MOULTON replied that there was no ground whatever for contending that the New River Company was in any different position from the other Companies with regard to the limitation of the dividend.

He would describe the action of the Legislature with regard to the Company when it came, in 1852, for a new Act enabling it to borrow further moneys and to make further works. At that time, the Water-Works Clauses Act of 1847 had been passed. The Act contained a large and carefully adjusted group of clauses, which were passed in that form by the Legislature because it was thought advisable that the various water-works should be substantially on the same footing with regard to their clauses—carrying out a policy similar to that of the Lands Clauses Act, the Railway Clauses Act, and the Companies Clauses Act, adopted about that time, and consistently applied since. It was required that when Companies came for powers, they should accept these uniform standards. The Water-Works Clauses Act gave most important powers to water companies. It gave specific power to break up streets generally (not depending on the will "of the Mayor and Commonalty of the City of London"); it gave them the power of recovering rents, and so on. But as they were giving these large powers, they also required the water companies to accept certain restrictions; and one group of clauses went to the question of the dividend which water companies enjoying those privileges might use. The clauses began by a limitation of dividend, with provisions that, if the dividend exceeded this, the surplus should be paid in a particular way into a fund, and after that time should be applied in reduction of the water charges. It represented a statutory bargain that one might have these powers, but that the powers should be used to get a dividend as large as the prescribed dividend, but from and after that time would have to be paid into the proper reserve fund. Now, the construction of the Water-Works Clauses Act was somewhat peculiar. This was for the purpose of making it easily incorporated in Special Acts; so that if the Legislature did intend to exclude some of the clauses, it could easily be done. What did the Legislature incorporate with this Act of the New River Company in 1852? It was as follows: "The Water-Works Clauses Act, 1847, excepting the provisions with respect to the communication pipes to be laid by the undertakers, and excepting the section 35 in the said Act." Section 35 was a very important one, dealing with the supply of water. It was the clause which obliged them to keep a constant supply of water; and, no doubt, it was a very great privilege extended to the New River Company that it should be excused the obligation. It had certain special obligations of the same type, not by any means so stringent, and the Legislature were content, therefore, to except section 35. It then excepted a whole group of sections with respect to communication pipes to be laid by the undertakers. When it specifically pointed out what was to be excepted, he could not help feeling that the whole of the rest of the clauses were intentionally kept in, and that, therefore, the New River Company should not be treated differently from the rest of the Companies in other respects. The 1852 Act for the first time brought the Company under a limitation of charges; and it was obviously intended in the clearest way to alter its status. What was the object of fixing and defining the capital of the Company but to enable this all-important limitation to be made? There was no other purpose whatever, excepting to limit the amount of profit to be received. Certain clauses were omitted; and therefore there was an intentional limitation by the insertion of the other clauses.

Sixteenth Day—Saturday, Nov. 21.

Costs in the East London Company's Case.

At the commencement of the proceedings this morning,

Mr. Balfour Browne said that the East London Company were in the greatest difficulty. A number of their costs were not in principle disputed by the Water Board; but they were very much in the dark as to the amounts. It had been suggested by Counsel for the Board that the matter should stand over until they could be ascertained.

The President pointed out that the Court were required to find what the costs were likely to be.

Mr. Balfour Browne: The Company can only give an estimate.

Mr. J. D. Fitzgerald said the estimates of witnesses on either side would probably vary greatly; and he thought it would be better to let the matter stand over, with liberty to apply, until the actual costs had been ascertained.

The President: If you will give an undertaking and pay such amount of costs as will be hereafter ascertained, we can do it; but I do not think strictly under the Act we can do it, because we are required to make these allowances for what is likely to be incurred. I am anxious to make the award to exhaust all the points under sub-section 8; but I am not sure that the better way might not be to make the award everything in sub-section 8 except this, and reserve the right to apply on any matter arising under sub-section 5, and under those words as to costs.

Mr. Balfour Browne and Mr. Fitzgerald both expressed the opinion that this would be the most convenient course; and it was decided it should be adopted.

The New River Company's Case.

The case of the New River Company was then resumed.

Mr. Moulton addressed the Court at considerable length, arguing against the contention of the New River Company that they were not limited as to dividends. His arguments, together with those of Mr. J. D. Fitzgerald, who followed him upon the same side, will be found sufficiently explained in the judgment.

The President, in giving judgment, said the question the Court had to determine was how far the New River Company were subject to limitation with regard to their dividends—the limitation of not paying more than 10 per cent. On the one hand, it was contended that this limitation, which was found in the Water-Works Clauses Act, did not apply to the Company; on the other hand, that it did so apply. He had endeavoured to treat the matter chronologically, and he began with the Charter of James I. which constituted the Company. It was quite clear that the Charter gave to the Company two powers or rights which were important to consider in the present discussion. One was the right to receive such payments from the persons to whom they could supply water as they could exact—an unlimited right for receiving payments for water; and there was a corresponding unlimited right to pay dividends to the Adventurers and to the King. These were the two powers which were vested in the Company and which it was material to consider. There was no legislation which affected the Company upon the point until the year 1852; but meanwhile, in 1847, the Water-Works Clauses Act had been passed. The first section provided that the Act should extend only to such water-works as should be authorized by any Act of Parliament thereafter passed. Therefore when the Act was incorporated by the subsequent Act (of 1852), all the clauses of it were incorporated with two exceptions—the clauses which were expressly excepted or varied, and those which might be inapplicable to the undertaking. The Act provided further that the undertakers should mean the persons by the Special Act authorized to construct the water-works. The fifth section provided the method by which subsequent legislation might refer to the Act; but it was careful to observe that the Water-Works Clauses Act contained sections in groups, and it was legitimate for Parliament to refer to them by these groups. Among the groups of clauses in the Act were two which came in immediate sequence. The first of these was a set with respect to the payment and recovery of water-rates; and the second was with respect to the amount of profit to be received by the undertakers when the works were carried on for their benefit. The first set did not apply except when the Special Act limited the rates of the Company and defined them. As soon as this was done, that set of clauses would apply and hang on to the undertaking. Then the second set provided that if the profits amounted to more than 10 per cent. upon the paid-up capital of the undertaking, the surplus might be applied in certain ways, and ultimately might be applied to a reduction of rates. Therefore both of these sets of clauses would apply if the Act of 1852 gave some limitation as to rates. The Act of 1852 recited that the Governor and Company of the New River were willing to undertake certain works; and it provided, by section 3, that the Water-Works Clauses Act of 1847, except the provisions with respect to the communication pipes to be laid by the undertakers and except section 35, should be incorporated. Certain other provisions followed. What the Court had to consider was whether the Water-Works Clauses Act was incorporated in the Act of 1852 with certain express exceptions. The result was that the earlier Act must be applied, unless there was something inconsistent in its application with the subject-matter to which it was proposed to apply it. There was no express exception by either of the two modes indicated by the Act of 1847 for restraining the application of the Act—one mode was an express exception, which was not to be found, in regard to the clauses in question; and the other was that they would be inconsistent, and inapplicable to the undertaking. This was what the Court set out. The next section referred to the capital expended by the Company in carrying out and completing their works in existence, which amounted to £1,519,958 and upwards; and it was enacted that the capital of the Company already raised and expended should be deemed to be £1,519,958. The set of sections in the Water-Works Clauses Act dealing with the amount of profit put a limit upon the profits by enacting that they should not exceed the prescribed rate, or, where no rate was prescribed, should not exceed 10 per cent. on the paid-up capital of the undertaking. It was said that the enactment of the Act of 1852 did not fit on to this clause. On the one hand, it was said it was intended to apply to the clause in the 1847 Act; and, on the other, it was said it could not apply. It was the duty of the Court to give a reasonable interpretation to both the Acts, and to make the series of sections in the Water-Works Clauses Act apply to the undertaking, unless there was something inconsistent or unreasonable in so applying them. One asked oneself: Was there any reason for introducing the fourth section into the Act of 1852, except for the purpose of applying it to that clause in the Act of 1847? It was said by the New River Company that there was—that it was for the sake of informing persons who were about to lend money under the subsequent powers of the Act. This did not appear to him to be at all an adequate reason. The truer reason was that it was inserted for the purpose of attaching the two Acts. It was said there was a great difference between raising and paying up. Under some circumstances a different meaning might possibly be put upon the two words; but in the present case, they were dealing with a Company who had no borrowed capital in the ordinary sense of the term. They had no debenture stock. The proprietary consisted of a body of Adventurers and of shareholders who were entitled to the benefit of the covenant which was given for the benefit of the King's shares; and it appeared to him that the meaning of the section in question was to treat what had been contributed by the Adventurers and by the King as being equivalent to paid-up capital of the Company. Then it was said that the undertakers only constituted the Corporation. This was true; but at the same time the undertaking practically consisted of the shares of the Adventurers and the shares held originally by the King. This was the view expressed clearly by the Legislature in the recited preamble to the Act of 1866. It recited that, by the Charter of Incorporation in the 17th year of the reign of King James I., the undertaking of the New River Company was divided into two moieties—respectively called the Adventurers' moiety and the King's moiety; and each moiety consisted of 36 parts of the shares. The recital seemed to express the truth of the language in the Act of 1852 to this effect; and if it were so, the Court was bound to take a reasonable interpretation of the meaning of the words in the Water-Works Clauses Act, and of their application. The profits of the undertaking meant the profits to be divided among the King's and the Adventurers' shares. The prescribed rate must apply to the one equally with the other; and what was called the paid-up capital must mean equally the sums advanced by the King and the sums advanced by the Adventurers. Then it was said that the King was not an undertaker. The word "undertakers," as defined in the Water-Works Clauses Act, referred to the persons by the Special Act authorized to construct the water-works. By the Act of 1852, the persons authorized to construct the works which were sanctioned by that Act was the Company; and the Company, according to the view of the Legislature, consisted of the two moieties. He was quite aware that, strictly speaking, the King's shareholders were not members of the Corporation; but they were members of it in such sense that the Legislature declared in 1866 that they were constituted part of the undertaking. It must be borne in mind that the Court was bound, if they

possibly could, to apply that group of sections with regard to the profits of the concern. The Legislature had not excluded them. The Court were therefore bound, if they could give a reasonable interpretation to them, to apply them. It appeared to him that it was a reasonable interpretation to say that the undertaking consisted of these two sets of shares; and the capital raised from these two sets of shareholders was the capital which was to be deemed the paid-up capital of the Company. But then it was said, on behalf of the New River Company, that there was a most important saving clause, and that this clause was operative in the present case to protect them from the application of the sections to which he had raferred. This saving clause was the 75th section, which provided that the Act, or anything therein contained, should not take away, lessen, or prejudicially affect any of the rights, remedies, powers, authorities, privileges, and benefits vested in or exercised by the Company or by or by virtue of any Royal Charter or Act of Parliament, &c. There were two rights to which he had referred—the right to receive any amounts on the sale of water, and the right to pay any dividend which existed before the passing of the Act of 1852. It could not be supposed that the right to charge an unlimited amount for the supply of water survived that Act, notwithstanding the words of the saving clause. It was not necessary for him to express an opinion, though he thought it would be difficult to contend that the express provisions of the Act were to be overcome by the saving clause, because the next section of the clause was an affirmative one, containing an important exception. It provided that all such rights, powers, and privileges, &c., except so far as the same were necessarily altered by the Act, should be and remain in full force. This exception, "except so far as the same is altered by this Act," was a declaration that where the Act was directly inconsistent, at any rate, with the rights, powers, and privilege which existed before, the Act was to prevail, and the privilege was to fail. As to the two powers to which he had referred, the power to levy unlimited rates was plainly gone. Did the power to pay an unlimited dividend survive? He had already said that, in his opinion, and he believed in the opinion of his colleagues, the section would plainly apply; and there being an absolute inconsistency between the right to pay an unlimited dividend and the 75th section of the Water-Works Clauses Act, the Act of 1852, which incorporated that Act, must prevail over the prior right, and the privilege which the Company had previously had must come to an end. He might pause here, because he thought that subsequent legislation threw little or no light upon the inquiry, which was to determine the Act of 1852. But, the matter being one of great importance, and it having been argued on both sides that subsequent legislation did throw a light upon it, it would be improper for him to leave it without making one or two observations. The first Act chronologically was the one of 1866, section 10 of which gave the right to the holders of new shares created under the Act to share *pari passu* with the old original shareholders, who were defined by the Act to mean holders of both the Adventurers' and King's shares. It provided that the person so holding a new share should be entitled to a dividend *pari passu* with the proprietors for the time being of original shares, or parts thereof, in the New River Company, in proportion to the amount paid for such new shares. It would be observed that the proportion was taken. It was an arithmetical proceeding in which there were four terms. Two of these must, of course, in each case be of the same nature. What were those of the same nature which they were now comparing? They were the original capital raised and expended on one side, and the amount to be paid on the other. He thought these, according to the view of the Legislature, came in the same category. They were things so capable of being of the same species that they were clearly capable of being brought in proportionately. It seemed to him that, instead of throwing any light upon the previous Act, it was only precisely in accordance with it. It did not in any way vary what would otherwise be the position. Then came the Metropolis Water Act of 1871. In the 47th section of the Act, it was declared that the Act should not apply to any of the lands or property of the New River Company not directly used in connection with their water supply, or authorize the Auditor to audit the accounts of the New River Company other than those relating to such supply. This was important only because it introduced for the first time a distinction between the two portions of the concern. It had been argued that the fact that the New River Company had landed estate made the enterprise a dual one, and that the provisions of the Water-Works Clauses Act therefore could not apply to such a Company. It appeared to him that this argument could not prevail. It was no doubt true that the Company held a landed estate which had ceased to be useful for the purposes of the undertaking; but it must be deemed to have been acquired for the undertaking. It was incident to all water-works companies that they held landed estate; and the fact that in 1871 the audit was confined to that portion of the undertaking which was directly water-works, and did not extend to landed estate which was not directly connected with it, seemed to be immaterial for the present consideration. Then came the Act of 1879, which was an Act to authorize the New River Company to raise further money. It recited "the original share capital expended as declared by the Act of 1852," and treated the contributions by the Adventurers and by the King as constituting the original share capital, as the Act of 1852 had done. This was strongly confirmatory of the view that the Legislature, when it spoke of the undertaking in 1852, meant the whole concern, including both classes of shares. Last of all, there came the Act of 1896, which contained a recital with regard to the capital, in somewhat different language. It said: "The original capital expended, as declared by the Act of 1852, was £1,519,958." The expression there was not "original share capital" as in the Act of 1879, but "original capital." Again, he did not think the recital threw any particular light upon the inquiry. Further, the attention of the Court had been directed to the fact that the same Act to which he had referred incorporated the Water-Works Clauses Act, 1847, and formed part of the Act. He had come to the conclusion, which he had already expressed, that this section did not appear to be material.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 472.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
200,000	5	Nov. 12	6½	Bombay, Ltd. . . .	5½—6*	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½*	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	230—235	..	5 2 2
300,030	,,	,,	9	Do. New . . .	173—178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	105—110	..	3 12 9
220,000	Stk.	Sept. 11	10½	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk. .	145—150	..	5 3 4
460,000	20	Oct. 15	10	British.	38½—39½	..	5 1 3
100,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c. .	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	10¼—10⅝	..	6 10 3
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5⅛	Commercial 4 p.c. Stk.	105—108	..	4 16 3
503,750	,,	,,	5	Do. 3½ p.c. do.	99—102	..	4 18 0
442,947	,,	June 11	3	Do. 3 p.c. Deb. do.	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	118—123	..	5 13 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—135	..	5 3 8
575,000	Stk.	Aug. 27	5⅛	Crystal Palace Ord. 5 p.c.	112—117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref. .	118—123	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 13	4⅛	Gas-light and Coke — 4 p.c. Ord.	85—87	..	5 1 2
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	86—88	..	3 19 7
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	106—109	..	3 13 5
4,193,975	,,	June 11	3	Gas-light and Coke — 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct. 15	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	Nov. 12	10	Imperial Continental .	198—203*	..	4 18 6
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99—102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A .	213—215	—1	4 13 0
718,100	,,	,,	7	Do. do. B .	163—165	..	4 4 10
306,083	,,	June 26	4	Do. do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
500,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 12	3½	Monte Video, Ltd. . .	9—10*	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	105—106	+½	4 4 11
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	96—97	—½	3 12 2
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	140—145	..	5 10 4
600,000	5	Sept. 30	7	Ottoman, Ltd. . . .	5⅛—6⅛	..	5 7 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6½	Ply'mth & St'house 5 p.c	123—128	..	4 15 8
851,070	10	Oct. 15	7	River Plate Ord. . .	10¾—11¼	..	6 4 5
300,000	Stk.	June 26	4	Do. 4 p.c. Deb..	94—96	..	4 3 4
250,000	10	Sept. 30	8	San Paulo, Ltd.. . .	10½—11½	..	6 19 2
135,000	Stk.	Sept. 11	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	239—241	..	4 3 0
523,498	,,	,,	10	Do. C	239—241	..	4 3 0
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	103—112	..	4 9 3
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.	118—121	+1	4 8 2
1,780,000	,,	July 10	3	Do. 3 p.c. Deb. . .	87—90	..	3 6 8
380,940	Stk.	Nov. 12	5	Southampton Ord. . .	104—108*	..	4 12 7
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton — A. 5 p.c.	115—120	..	5 0 0
313,020	,,	,,	4⅛	Tottenham and Edmonton — B. 3½ p.c.	95—100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.. . . .	8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	58—100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93—98	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅛	Chelsea, Ord. . .	310—310	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref.. .	145—148	..	3 7 7
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132—137	..	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb. .	135—140	..	3 4 4
1,720,560	Stk.	Oct. 15	8	East London, Ord.. .	205—215	+9½	3 14 5
654,740	,,	June 11	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	92—95	..	3 3 2
700,000	50	June 11	10	Grand Junction — 10 p.c. max..	120—125	..	4 0 0
310,000	Stk.	Sept. 30	4	Grand Junction — 4 p.c. Deb..	120—125	..	3 4 0
708,000	Stk.	Aug. 13	10	Kent	275—285	..	3 10 2
160,000	,,	,,	7	Do. New, 7 p.c. max..	185—195	..	3 11 10
1,043,800	100	June 26	11	Lambeth, 10 p.c. max..	285—295	..	3 14 7
406,200	100	,,	8½	Do. 7½ p.c. max..	205—215	..	3 19 1
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb..	120—125	..	3 4 0
500,000	100	Aug. 13	12⅛	New River, New Shares	370—390	..	3 5 7
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb..	120—123	—1	3 5 1
902,300	Stk.	June 11	7½	South-wark and Vauxhall — Ord. . . .	230—235	+5	3 3 10
126,500	100	,,	7½	South-wark and Vauxhall — 7½ p.c. max.	200—210	..	3 11 5
489,200	Stk.	,,	5	South-wark and Vauxhall — 5 p.c. Pref. .	143—148	—2	3 7 7
1,019,585	,,	Oct. 15	4	South-wark and Vauxhall — 4 p.c. A Deb.	118—123	—2	3 5 1
1,155,066	Stk.	June 11	10	West Middlesex. . .	275—285	+10	3 10 2
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	133—138	..	3 5 3
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	92—95	..	3 3 2
				* Ex div.			

He had only to add that Lamplough's case (as cited) did not seem to have involved an argument upon the question before the Court. The point seemed rather to have been assumed than argued. He did not propose to say anything with regard to the exact comparison of the saving clause in that case with the present one. The point had not been argued in that case; and it was not material to consider it. He only added that that case was not inconsistent with the conclusion at which the Court had arrived. He had spoken in the judgment generally in his own person, because it was possible his brethren might not concur in everything that he had said; but he was at liberty to say that they entirely concurred with the conclusion he had expressed.

At the termination of the judgment,

Mr. BALFOUR BROWNE said the Court would understand the matter was one of vital importance to the Company. The judgment would make an entire difference to all the tables which had been handed in. He might say at once that his claim of 13 millions odd could not possibly be substantiated at all.

The PRESIDENT: I am quite aware of that.

Mr. BALFOUR BROWNE: I think the Court will come to the conclusion that I am entitled to ask for a special case.

The PRESIDENT: I have no doubt you are entitled to that.

A discussion ensued as to whether the case of the New River Company could be proceeded with; and it was suggested that two alternative sets of tables should be prepared by the Accountants—one on the basis that the decision of the Court would be upheld by the House of Lords, and the other on the basis that it would be reversed.

The PRESIDENT pointed out that the difficulty, if this course was not pursued, was the length of time which must elapse before the House of Lords gave their decision.

Mr. BALFOUR BROWNE said it might be years, or at any rate a year and a half. The more he thought of it, the clearer it seemed that it would be better to go on, and present the two alternative sets of tables. The decision would not affect the facts of the case at all; it only cut down the figures.

Sir JOHN WOLFE-BARRY: It would be quite possible to take the case in an alternative way, and find an alternative award, as was done in a very important case in connection with tramways.

Mr. BALFOUR BROWNE: Yes; find in the alternative, so that the decision of the House of Lords shall be final.

The learned Counsel then resumed his opening speech on behalf of the New River Company, and the Court adjourned till yesterday.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of the proprietors in this Company was held at the Offices, Marylebone Road, on the 17th inst.—Mr. EDMUND BOULNOIS, M.P., in the chair.

The SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting; and the report of the Directors was taken as read. He afterwards read the report of the Auditors, which stated that the capital of the Company remained at £1,986,228; and that the total expenditure on works amounted to £1,965,351, including £3229 expended in the half year. The revenue for the six months ended Michaelmas was £158,194, against £154,317 for the corresponding period of 1902. The water-rental received during the half year, including £70 for street watering, was £143,393. The balance to the credit of the dividend and interest account was £66,446.

The CHAIRMAN stated that, as usual, the Directors were able to report that the works had been maintained during the half year in a thoroughly efficient condition; and, as the proprietors were aware, it had always been the aim of the Board to see that the property of the Company was efficiently maintained. He was sure if any impartial person were to visit and inspect the works, he would be obliged to admit that nothing had been left undone in connection with them. The report stated that an amount of £22,000 of intercommunication debenture stock had been issued at an average price of £93 15s. 7d. per cent., producing, after paying the expenses of the issue, £20,500—the amount authorized to be raised in respect of the Company's expenditure for intercommunication works.

Mr. JOHN DREW: It is 3 per cent. stock, I believe?

The CHAIRMAN: Yes. Continuing, he stated that the process of linking up the works of the eight London Water Companies had been completed; and in the event of any one Company being short of water through unforeseen circumstances, the district supplied by that Company would now not suffer in any way. A perfect organization for an absolutely certain and continuous supply to the whole of the Metropolis would therefore be taken over by the successors of the Companies. With reference to the half-yearly statement of accounts, the Official Auditor certified the figures to be correct; but he went on to say: "I am of opinion that the account is imperfect, as no provision is made in the account for the payment of a sum of money which has accrued due, and should be carried by the Company to a sinking fund in accordance with the requirements of section 81 of the Staines Reservoirs, &c., Act, 1896, although water was obtained in May, 1902, by means of the works authorized by that Act." It was true that the Staines reservoirs had been filled with water; but this was done by the Contractors under an arrangement with the Thames Conservancy Board, in order to test the stability of the works. The Joint Committee and the three Companies interested in the works—the New River, the Grand Junction, and the West Middlesex—denied, however, that water had been obtained by them, or that they were liable to any such payment as the Official Auditor contended. The three Companies maintained that, according to the Act, water must be taken by them, or one of them, before they incurred any liability to make a payment to the City Chamberlain; and their contention was justified by the fact that when water was taken by the Staines Reservoirs Joint Committee, they would become liable for the payment of a sum of £5000 a year to the Thames Conservancy, who not only had not made a demand on them for such

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payment, but had acknowledged that no water had been taken within the meaning of the Act. He therefore thought that they were justified in the course they were adopting in resisting any such claim as that referred to; and, surely, under any circumstances, it was obvious that the taking of water by the Joint Committee must precede the taking of water by the three Companies or any one of them. The Company's claim for the sale of their undertaking was duly sent in to the Court of Arbitration on May 16 last; and the Court, who commenced their sittings on the 26th ult., seemed inclined to push on with the proceedings quickly, in order to come to a determination at an early date. He supposed that no undertakings which had been bought out compulsorily had ever gone through from time to time such ordeals of investigation and examination at the hands of Parliamentary Committees, Royal Commissions, &c., as had the London Water Companies previous to the Purchase Act; and he was bold to say that, as far as their Company were concerned, they had always come out from these inquiries satisfactorily and well. The Directors, therefore, went into the arbitration with no misgivings; but, on the contrary, with every confidence in the result. The arrangement and preparation of the Company's case had caused the Board considerable anxiety; and, in the proprietors' interests, they had called in the best advice they could obtain. As regarded this matter, he could not speak in too high terms of the way in which the interests of the Company had been looked after by their staff; and at the proper time the Board would make an arrangement suitably recognizing their zeal and devotion—a course which he felt confident the proprietors would approve. The accounts showed an increase of nearly £4000 in the past half-year's gross revenue, as compared with that of the corresponding period of 1902; but the proprietors would derive no benefit from this, as no more than the statutory dividend could be paid. If the Company had been allowed to continue their admirable work unmolested, the consumers in their district would have derived great advantages from the enhanced water-rentals. It would ill become him to make any remarks or comments on the proceedings now pending in the Arbitration Court; but the proprietors might be perfectly sure that, when the Company's turn came—and it was fourth on the list—the Board would watch over, and protect as far as they possibly could, the interests of the Company. He concluded by moving the adoption of the report and accounts.

The Deputy-Chairman (Mr. Jackson Hunt) seconded the motion, which was carried unanimously.

The Chairman next proposed the declaration of a dividend on the consolidated stock for the half year ended Sept. 30 at the rate of 10 per cent. per annum, payable, less income-tax, on and after Jan. 5.

The Deputy-Chairman seconded the resolution, which was carried.

On the motion of Mr. Drew, a cordial vote of thanks was afterwards passed to the Chairman and Directors for their services to the Company.

The meeting was then made special, when, on the motion of Mr. Wace, seconded by Mr. J. B. Sharp, a resolution was passed proposing Mr. Frederick Edwin Bodkin a Director, in the place of the late Hon. Edward Henry Johnstone.

LIGHTING OF FOREST ROW BY GAS.

The village of Forest Row, near East Grinstead, took last week a noteworthy step in the direction of bringing itself into line, in the matter of lighting, with other places in Sussex. The East Grinstead Gas and Water Company have long had powers of supply over the parish—dating back, in fact, to the time when the district formed part of the parish of East Grinstead; but they have not hitherto felt justified in incurring the heavy expense of laying mains to the village. Some of the more public spirited among the residents, however, recently gave such guarantees as the Directors considered would justify them in the venture; and the work, which has proved to be one o some magnitude, was completed last week. Gas is now in use in about 20 houses in Ashurst Wood and Forest Row, and orders have been given for connections to be made to about 30 more; so that it has already been demonstrated that the venture supplies a widely felt want. The mains were laid under the superintendence of Mr. D. T. Livesey, the Company's Engineer and Manager. To celebrate the turning on of the gas, a number of gentlemen specially interested in the event dined together at the Swan Hotel—Mr. A. Faber in the chair—the viands having been cooked by gas laid on to the premises the same day. The toast of "Success to the East Grinstead Gas Company" was responded to by Mr. W. V. K. Stenning, the Chairman, who gave some interesting particulars in regard to the history of the undertaking, which was started in 1855. He expressed the hope that the introduction of gas into Forest Row would stimulate the trade of the neighbourhood, and lead to the lighting of the public roads. Mr. Livesey also replied, and furnished some details as to the extent of the work involved in providing the village with gas. He said the Company had laid down 350 tons of cast-iron pipes, and used nearly 10 tons of lead in putting them together. The total length was 10,500 yards—as nearly as possible six miles of mains. They began work on the 14th of June, and had averaged about 85 yards for each working day—not a bad performance, bearing in mind the wretched weather. The expenditure had been very considerable; the natural features of the district involving extra outlay. Forest Row was 200 feet lower than East Grinstead, and as gas rose instead of falling, it meant a loss of 2 inches in pressure between East Grinstead and Forest Row; so that extra pressure had to be put on to drive it down. The pipes had cost £1870, and £650 had been paid in wages. The total outlay would reach £3000, which was the amount of the original estimate. It now remained for the people to show they appreciated the boon provided.

The Directors of the Grand Junction Water-Works Company have decided to recommend the declaration of a dividend for the half year ending Sept. 30, at the rate of 10 per cent. per annum on the £50 "A" and £25 "B" shares, 7½ per cent. per annum on the £25 "C" shares, and 7 per cent. per annum on the £50 "D" shares—leaving a balance of £21,792 to be carried forward.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . .	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA. . . .	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN. . . .	500,000	YORK (Second Contract) . .	750,000
WINDSOR ST., BIRMINGHAM (Second Contract) . . .	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract) .	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil) . . .	125,000
LINDSAY (Remodelled) . .	125,000	CRYSTAL PALACE DISTRICT .	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.) . . .	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract). .	250,000	ENSCHEDE (HOLLAND) . .	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract) . .	750,000
		KINGSTON-ON-THAMES . .	1,750,000	TORONTO (Fourth Contract)	1,000,000

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LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

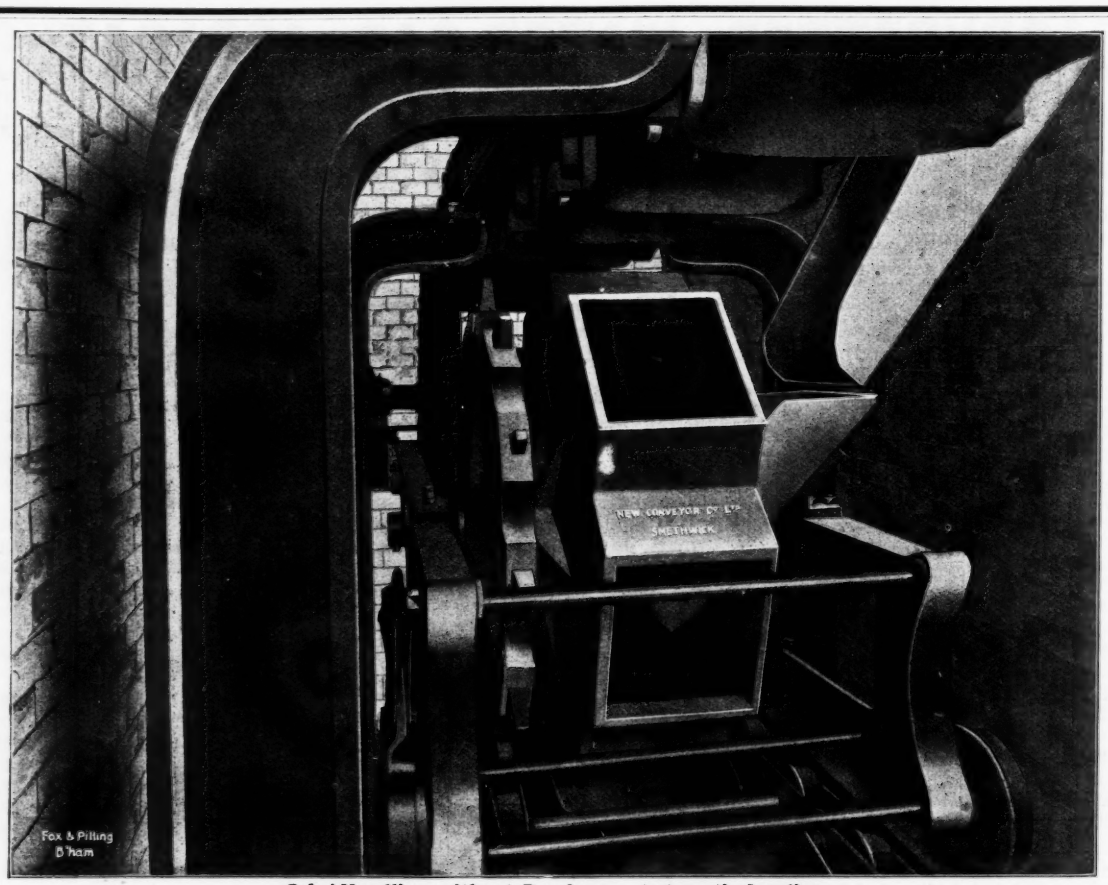
A GAS-WORKS GARDEN.

Under the above heading, "The Gardeners' Chronicle" for the 14th inst. publishes a photograph of a part of the garden of Mr. Charles Chambers, the Assistant-Manager to the Harrow and Stanmore Gas Company. This garden (which is right beside one of the gasholders) is simply a mass of brightness, and, judging by the illustration, would be hard to beat—either near a gas-works or elsewhere. It has been even finer in previous years, under more favourable meteorological conditions. Our contemporary remarks that the Engineer and Secretary of the Company (Mr. J. L. Chapman) is also a great lover of flowers, and favours the keeping of shrubs, flowers, &c., about the works. Consequently, at the entrance in South Harrow, there is a row of large laurels, with their leaves almost touching the gasholders, and quite near to them the hawthorns bloom well in their season. "The fact is," says "The Gardeners' Chronicle," "that not all that is said about the injurious effect on vegetation by gas-works and factories is true. In dwelling-houses and other confined places, gas quickly causes damage; but in the open air the injury often pointed out as the effect of gas or odour from chemical works is generally the consequence of curtailed water supply, causing drought, and the injury more often than not comes from the root. In the neighbourhood of London and other large places where building developments have spread over what used to be agricultural land, evidence of this is given in the trees, which remain either dying wholly or in part year after year. Those trees have been raised by an existing water supply; and when drainage systems take a large proportion of the supply away, the trees cannot maintain their dimensions, and have to die back to a size which the water supply can nourish."

The Tenbury Gas Company, acting on the advice of Mr. B. W. Smith, the Gas Engineer of the Walsall Corporation, have decided to put down new exhauster, purifiers, steel tank and gasholder, &c., and have placed the work in the hands of Messrs. R. Dempster and Sons, Limited, of Elland.

STIMULATING GAS BUSINESS AT SANDWICH.

It is only a little more than a year since Mr. T. E. Pye was appointed Manager of the Sandwich Gas-Works; but since his tenure of the position he has displayed a great deal of activity in developing the business. He has issued leaflets showing the consumers what they can do with gas-fires and with a pennyworth of gas carefully used, and has greatly facilitated the purchase of coke, breeze, and tar. He has commenced in the local paper a series of articles on the use of gas in the house; and he never allows an opportunity to slip for demonstrating its value as an illuminant. Last week, there was held the annual flower show, which is an important function for this part of Kent, and one which always attracts a large number of visitors. Mr. Pye was asked to light it, and he consented to do so on the understanding that he would be allowed to make a miniature gas exhibition of it. This he did by fitting up the latest types of incandescent burners, having an



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aggregate lighting power of 3000 candles; the total consumption of gas throughout the show, including that used on the day of preparation, being only 4200 cubic feet, costing well under 20s. Cards, giving prices and particulars of the fittings, &c., were freely distributed all over the hall; so that the Gas Department got a very good advertisement. The Town Council recently had before them, and adopted, a long report presented to the Gas Committee by Mr. Pye. His labours have been appreciatively recognized by an increase in his salary, and his appointment as Gas Engineer and Manager to the Corporation.

GOOD PLUMBING AND WATER-WASTE PREVENTION.

Last Tuesday, a conference took place at the Guildhall, between the Plumbers' Company, the Royal Institute of British Architects, and representatives of some of the larger water undertakings in the country, with reference to the waste of water in domestic use, the efficiency of plumbing work in connection with the public supply of water, and the registration of plumbers. Dr. R. CRAWFORD (the Warden of the Company) occupied the chair. The Royal Institute of British Architects were represented by Mr. H. D. Searles-Wood, Mr. Thomas Blashill, and Mr. W. D. Caröe; the British Association of Water-Works Engineers by the Secretary (Mr. Percy Griffith, M.Inst.C.E.); and there were delegates from Birmingham, Bradford, Cardiff, Dublin, Glasgow, Hull, Liverpool, Sheffield, and Plymouth.

The CHAIRMAN explained the efforts which the Company had made to secure the better practical education of plumbers, and said that, though the country had been thoroughly roused to the great advantages to be derived from the increase of skill and education on the part of this artisan, especially in the case of the young man, it must be acknowledged that the movement in the direction which was most essential—namely, the sanitary side—had not been quite successful. Throughout the country, 12,000 plumbers had been registered; and the position of the plumber had undoubtedly greatly changed. The Company had now been asked to take a further step, and endeavour to act as a connecting link between architects and the water supplying authorities, with a view to secure the profitable and economical use of water. In convening the conference, the Company did not suggest for one moment that the water authorities did not know how to manage their own affairs; but it was thought possible that the Company might act as a sort of line of union for the discussion of the means to be adopted in order to secure greater uniformity in respect of bye-laws, fittings, and the skill and qualifications of plumbers. As a preliminary to the discussion, he proposed—"That this conference of architects and water authorities approves the efforts of the Worshipful Company of Plumbers to secure the more efficient training of plumbers, and the registration of qualified men, and pledges itself to support the Company in their endeavour to secure the necessary legislation in furtherance of that object."

Alderman HIND (Stockport), in seconding the resolution, pointed out that the effect of the Company's efforts was visible in the improvement which had taken place in plumbers' work during the last 25 years, and expressed the hope that architects and others would support the Company by employing registered plumbers in preference to others.

The CHAIRMAN mentioned that the Bill promoted by the Company for the registration of plumbers had been viewed favourably by the Local Government Board; but the Government had not seen their way to afford the necessary time to secure its passing through Parliament.

The resolution was carried.

Mr. H. D. SEARLES-WOOD proposed—"That, with the object of giving practical effect to the previous resolution, the representatives of the Royal Institute of British Architects and the water authorities present recommend that preference be given to the employment of registered plumbers to carry out and inspect plumbers' work executed under architects and water authorities." He explained that, while the Institute were strongly in favour of the movement for the better education of the plumber, they could not pledge themselves to the sole employment of registered plumbers, because, as architects, they did not interfere between the contractor and the men he employed. But whatever system of technical training might be adopted, the Institute would strongly deprecate any interference with the apprenticeship system. It was one thing to execute specimen joints and other pieces of work under the direction of a master in a well fitted-up shop at a technical school, and quite another to do it under the ordinary conditions in which the work had to be done in a building.

ALDERMAN HOLDSWORTH (Bradford) seconded the motion.

Mr. E. A. LEES (Secretary to the Water Committee of the Birmingham Corporation) said that in Birmingham there were a good many firms of the highest repute who had not allied themselves with the registration movement; and the Water Committee could not shut their eyes to the fact that these firms carried out their work in a way to which no exception could be taken.

Mr. ATKINSON (Hull) said that the same difficulty would arise in his town. If registration was to be adopted, it should be optional for a period, and only compulsory after the lapse of several years.

Alderman HOLDSWORTH observed that registration gave a status to a plumber, and was an inducement to men to register themselves.

Alderman HIND remarked that they could not at present hope to make registration compulsory; but they could make it desirable and to the advantage of plumbers to register themselves.

The CHAIRMAN pointed out that there was nothing in the resolution to warrant the rejection of the plumbers who were not registered; but the object was, of course, to encourage the registration of plumbers.

The resolution was unanimously adopted.

A discussion followed on the subject of waste prevention in the domestic use of water, the standardization of fittings, model bye-laws and regulations, and other measures which might be submitted for the approval of the Local Government Board. Eventually, it was resolved to form a Committee, representing the Plumbers' Company, the water authorities, architects, and the British Association of Water-Works Engineers, to consider the question of standard regulations and fittings.

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BURY AND DISTRICT JOINT WATER BOARD.

The Past Year's Working.

At last week's meeting of the Ramsbottom Urban District Council, the Chairman (Mr. J. Garnett) gave a short account of the business transacted by the Bury and District Joint Water Board during the past year. He mentioned the passing of the Bill for the construction of the reservoirs at Dearden Clough Brook, after stiff opposition had been encountered from the Lancashire and Yorkshire Railway Company, and explained that the higher level reservoir was practically a substituted scheme for the pumping-station which the old authority had power to construct at Haslingden under the Act of 1899. The higher level reservoir alone would give them an additional supply of water which the pumping-station would not have furnished. Not only this, but the Board had now got control over one of the finest streams in the country. The filtration works at Hapton and Clough Bottoms were getting nearer completion. During the past year, they had expended over £21,500 in the purchase of land adjoining the reservoirs for the purpose of controlling the gathering ground. In his opinion, if this course was properly carried out, as the Board intended it should be, they would have no occasion for any filtration system in addition. The enormous expenditure on filtration, and in the purchase of the gathering grounds, both of which were imposed upon them by Parliament, was the principal reason why the water undertaking had not shown a profit. As to the Ogden reservoir, the contract had been let for just under £104,000; and the work of construction was proceeding very satisfactorily—in fact, more satisfactorily than even the engineers anticipated. He went on the Board with rather a prejudiced feeling with regard to the Ogden reservoir undertaking; but, by watching the valley, he had found out that it contained an enormous amount of water—such a quantity that for practically eight months out of twelve there was a large amount running to waste, which would give them a good and regular supply. They were now making arrangements for way-leaves, which would also mean a great expenditure. Another reason why they had not made a profit was because money had been dearer. But, taking the undertaking as a whole, they were getting on a sounder footing in many respects. During the year they had repaid nearly £78,000 of money lent them by the Bury Corporation, under the Act of 1899; and they were now making arrangements for the payment of the balance. The difficulties of the situation could only be appreciated by those who were in close contact with the undertaking; and the Board were very jealous of any increase in the ordinary working expenses of the concern.

Reduction in Price.—The Torquay Gas Company will reduce the price of gas from 3s. 3d. to 3s. per 1000 cubic feet after Christmas.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas Committee of the Dundee Town Council met on Tuesday to consider the report of the Sub-Committee who had been dealing with the subject of the failure of the gas supply on the evening of the last autumn holiday. In the report of the Sub-Committee, it was stated that on holidays and other occasions when there is a falling-off in the consumption of gas, some of the retorts are thrown off. This was done on the occasion which was being dealt with; but the exhauster pumps were not slowed down at the same time—the result being that when the gas was exhausted from the retorts, air was forced into the gasholders. In the opinion of the Sub-Committee, the incident would in all probability never have occurred had there been sufficient gasholder accommodation, as it would not have been necessary to throw off any of the retorts. This report having been read to the Committee, a discussion followed, in which, it is reported, it came out that, owing to the machinery being new, there seemed to have been some misunderstanding among the employees as to what should be done. Both the Manager and the Assistant-Manager were absent when the affair occurred; and no one had apparently thought it necessary to slow down the pumps in proportion as the retorts were thrown off. The Managers stated that an arrangement had been come to which would prevent any recurrence of the mishap in future. Several members urged the necessity of more gasholder accommodation. Another gasholder had been advocated by the late Mr. Foulis; and its site had been shown on the plans. On the other hand, it was agreed that the Sub-Committee should not have taken up this matter, as it was not in their remit. All they were asked to do was to report as to the accident; and they should have stopped there, leaving the question of another gasholder to be raised by the Manager. To this view it was replied that the Sub-Committee were entitled to deal with the prevention of a similar accident, as well as to inquire into what had actually occurred. The Committee agreed to accept the report of the Sub-Committee as a statement of facts as to how the accident took place; and with regard to the proposal that a new gasholder should be erected, it was thought that the Manager should be asked to submit a report on the whole question, dealing with the prospective requirements of the city in view of the increase in the consumption, which would include the questions both of manufacture and storage of gas. It would seem, from the tone in which this report of the Committee's doings is pitched, that they have not been prepared for an increase in the consumption of gas; and that now, when it is being experienced, they are not over-anxious, to say the least, to provide for it. They have spent nearly £100,000 upon gas-works extensions in recent years; and the prospect of having to face an outlay of £40,000 or £50,000 for a new holder almost staggers them. It will be interesting to see how the Town Council will deal with the subject when it comes before them.

WILLEY & CO.

RETORT WORK. INCLINES A SPECIALITY.

CONDENSERS, ANNULAR AND HORIZONTAL.

WASHERS, LIVESEY'S PATENT

PURIFIERS AND VALVES

PICKERING'S PATENT.

STATION METERS AND GOVERNORS

SIMPSON'S PATENT.

GASHOLDERS

ANY SIZE.

SEND US YOUR ENQUIRIES.

WHY OPEN A LOT OF ACCOUNTS WHEN YOU CAN COME TO US FOR EVERYTHING, AND OBTAIN IT AT THE LOWEST PRICES?

Works: LONDON AND EXETER.

There is a prospect of the dispute between the Coatbridge Gas Company and the Airdrie Gas Company as to their respective areas of supply being amicably adjusted, and the litigation in the Court of Session (*ante*, p. 360) being withdrawn. The two Companies are very much mixed up, not only as regards area of supply, but also as regards membership; and they have, it is understood, agreed that the Coatbridge Company shall retain the right to supply gas in part of the area claimed by them, and that the Airdrie Company shall be reconstructed and obtain parliamentary powers Notice has been given by the Airdrie Company of application for such powers within the extended boundaries of the burgh, and without them, excepting certain portions. When the notice was published, the Corporation of Airdrie, fearing that there was about to arise a situation in which they would be at the mercy of the two Companies, met and resolved to themselves seek powers to acquire the undertaking of the Airdrie Company and such portions of that of the Coatbridge Company as lie within the parish of New Monkland, with the repeal of the powers of the Coatbridge Company to supply gas within that portion of the burgh of Airdrie.

At a meeting of the Gas Committee of the Arbroath Town Council on Wednesday, the Manager (Mr. A. C. Young) reported that the following new plant had been introduced into the gas-works: Two exhausters and engines, in a house by themselves; a scrubber and engine upon the arrangement of Messrs. W. C. Holmes and Co., with tar-extractor; a storage-well for ammoniacal liquor and tar; four steam-pumps for ammoniacal liquor and tar; and a new steel roof to the retort-house, the walls of which have been raised by 12 feet, giving more air and light in the house, greatly to the comfort of the workmen; also that the columns which supported the old roof had been removed, giving much more freedom to work. The total cost is said to have been under the estimate. The Committee visited the works, and expressed great satisfaction with all that had been done.

After an experience extending over two years, the Alloa Town Council have found electric lighting to be too costly; and they are going in for incandescent gas lighting in the streets. Under the supervision of Mr. J. W. Napier, the Gas Manager, some high-power lamps are being put up on trial; and eventually the electric arc lights will be entirely displaced.

The proposal of the Corporation of Falkirk to extend their burgh boundaries so as to include the district of Larbert is to be opposed by the Larbert Parish Council, a meeting of which was held on Monday for the purpose of considering the situation. It was stated that the proposal of the Falkirk Corporation was to incorporate Larbert into the water area, but that the real reason was that they wished to secure gas powers in the district. Upon this subject, the Chairman (Mr. Graham, of Larbert) said he had spoken strongly of their building new gas-works of their own; and he was the more convinced of the wisdom of this step by seeing, from the accounts of the Falkirk Corporation, that, after providing for the sinking fund, they, instead of placing £100 to reserve fund, and instead of reducing the price of gas, had placed £1000 to reserve and carried forward an additional £600. This policy might be continued or aggravated; and Larbert would thus be made to pay a price far exceeding that at which they could provide gas for themselves. In any case, it would be strange if Larbert, with works on modern principles, placed near a railway, could not furnish themselves with a gas supply on very moderate terms. When new works were erected by Falkirk, and their cost added to the £123,000 of present capital, cheap gas would be out of the question for some years. The Council formed themselves into a Committee of Vigilance, in order to resist annexation by Falkirk, and decided to call a meeting of the ratepayers. It was also resolved to request the County Council to take the necessary steps to conserve the interests of the district.

At a meeting of the Galashiels Town Council on Monday, a letter from the Secretary of the Galashiels Gas Company was submitted, which stated that the Directors had been informed that gas was burned in the fire engine house which did not pass through a meter, and that since the erection of the engine-house, about 39 years ago, the gas consumed in it had not been paid for. The Directors asked (1) that a meter be immediately placed in the engine-house, and the gas passed through it; and (2) that they be informed what proposal the Corporation had to make for settling the price of the gas consumed. The Works Committee of the Corporation recommended that, as the Company requested, the gas be paid for in future, and that the pipes in the engine-house be altered so that the gas would pass through the meter at present in the burgh buildings. The Committee were investigating the circumstances under which the connection with the gas-main was originally made, and would submit a report to a future meeting. Mr. Stevenson said he had heard it stated 30 years ago that this was the only privilege the Gas Company gave the town—free gas for the engine-house. He did not think the Directors, or anyone else, would believe the Corporation deliberately stole the gas. The fire-engine was provided by the manufacturers of the burgh; and he took it the Gas Company allowed the gas as their share of the cost. The Clerk, in reply to a question, said there was nothing about the matter in the minutes of the Corporation. The report of the Committee was approved. It very probably is the case that the Gas Company agreed to give gas free for such a commendable purpose as assisting to prevent the spread of fire, and more particularly so as gas was looked upon as one of the chief sources of danger in the matter of fire; but there is a very great difference between what was required 39 years ago, when at most a few lights turned down would be all that was necessary, and now, when fire-engines are worked by steam, and the water in the boiler is kept perpetually hot by means of a gas-fire.

The Second Division of the Court of Session recently disposed of an action of multiple-poinding in regard to a sum of £717 5s. 8d., belonging to the estate of the late Alexander Gall, a contractor of Alloa. At the time of his death, in 1895, he was engaged in carrying out a contract with the Stirling Water Commissioners, and this work was completed by his son, who was his father's Executor. The balance of £717 ultimately left in the hands of the Commissioners was arrested by Mrs. Gall, and also by Messrs. Ewing and Cuthbert, the Agents of the

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(ALSO SHILLING-IN-THE-SLOT)

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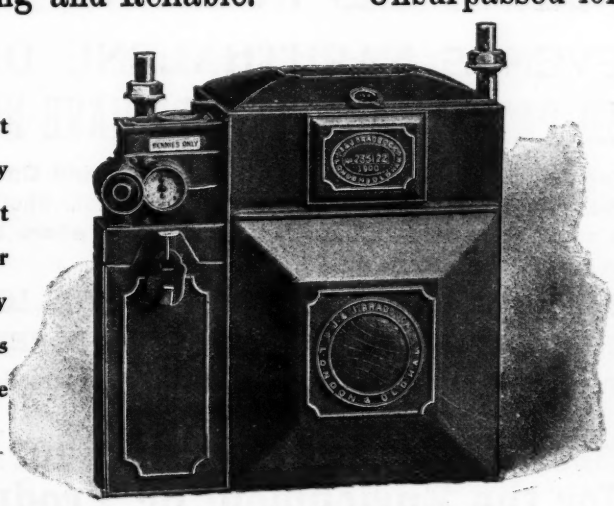
Very Strong and Reliable. **Unsurpassed for Accuracy.**

The Attachment does not form part of the ordinary Meter Index, and need not be taken off if the Meter had to be repaired at any future time. Hence repairs are not rendered more difficult.



The Patent Crown-Wheel Arrangement for enabling the feet allowed per penny to be easily and quickly altered while the Meter is *in situ* is most convenient, definite, and satisfactory. Any number of feet per penny may be allowed.

No. 223. Braddock's Tin-Cased Prepayment Meters.

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Executor; and the Commissioners raised the action for decision as to who was entitled to the fund. Mrs. Gall claimed as part of her *jus relictæ;* Messrs. Ewing and Cuthbert, on the ground that their claims were for part of the administrative expenses of the executry, and ought therefore to be satisfied before the fund for *jus relictæ* was struck. In the Outer House, the case came before Lord Stormonth-Darling, and he found the widow entitled to the whole fund and to expenses as against the other claimants. His Lordship did so on the ground that Mrs. Gall's action for her *ius relictæ* was settled by a joint minute, and that the competing claimants not only were aware of this, but were the Law Agents through whom it was brought about. It seemed to his Lordship that they ought to have obtained payment from the proper debtor at the time, and could not now deprive Mrs. Gall of the right she had acquired. He accordingly gave effect to the priority of her arrestment. The Edinburgh Agents of the executry claimed £98 16s.; but this also was repelled. Messrs. Ewing and Cuthbert appealed against this judgment; but their Lordships, for the same reasons as the Lord-Ordinary, adhered, with expenses.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 21.

Sulphate of Ammonia.

There has been more buying, chiefly for Colonial account, and although supplies have also been more abundant, prices have been fairly well maintained. The quotations at the close are £12 per ton f.o.b. Hull and Leith, and £12 1s. 3d. per ton f.o.b. Liverpool. Interest is still mainly centred in the forward position, and £12 10s. per ton for January-June delivery is again reported paid f.o.b. Leith, it is understood on speculative account. Direct buyers, having spot prices before them, for the most part refuse to pay the premium demanded for Spring delivery, although they would be willing to pay an advance on prompt values.

Nitrate of Soda.

This remains as last reported, both on spot and for delivery ahead. Spot quotations are 9s. 6d. per cwt. for ordinary quality, and 10s. 3d. for refined.

LONDON, *Nov.* 20.

Tar Products.

Markets generally have been fairly steady, with the exception of pitch, which continues to fall in value, though in reality there is no business doing. Tar distillers as a rule maintain their quotations for early shipment; but for forward delivery the market is undoubtedly weak, and offers at very much under existing values are being made upon the Continent. Benzol continues steady, with a good demand for gas enriching purposes. There is more inquiry for toluol; but makers do not care to offer at present—in fact, many distillers have discontinued producing this article. The demand continues good for solvent, especially for prompt delivery. Creosote values are well maintained, especially in London, where the demand is very strong. Crude carbolic remains in the same position; but crystals are a little easier all round.

The average values during the week were: Tar, 23s. 6d. to 29s. Pitch, London, 47s. to 47s. 6d.; east coast, 46s. to 46s. 6d.; west coast, 45s. 6d. to 46s. Benzol, 90 per cent., 10¾d. to 11d.; 50-90 per cent., 8d. Toluol, 7½d. to 7⅝d. Crude naphtha, 3½d.; solvent naphtha, 9d. to 9⅛d.; heavy naphtha, 10½d. to 11½d. Creosote, London, 1 1/16d. to 1⅛d.; North, 1⅛d. to 1¼d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 6d. to 1s. 6½d. Refined naphthalene, £5 to £8. Salts, 24s. to 26s. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes decidedly quiet, especially for prompt delivery. Beckton still quote £12 6s. 3d. for prompt, but ask £12 12s. 6d. for January-June, and are reported to have declined £12 10s. over this period. The South Metropolitan Company quote £12 7s. 6d. for December, and it is believed have only a very small quantity to dispose of up to the end of this year. At Hull, business has been done at £12 for good makes for prompt delivery; but £11 17s. 6d. has been accepted in more than one instance for discoloured. At Leith, the market is decidedly quiet, especially for prompt delivery. Business is reported at £12 for November-December shipment; but as a rule makers ask £12 1s. 3d., and forward they still maintain their price of £12 10s. At Liverpool, small sales are reported at £12 1s. 3d.; but there is not much business doing.

COAL TRADE REPORTS.

Lancashire Coal Trade.

It cannot be said that the coal trade of this district develops any material improvement. There is still the exceptional situation that, notwithstanding the winter season has now fairly well advanced, comparatively few collieries are running full time. Requirements for house-fire consumption necessarily show some expansion, and changes in weather conditions have an appreciable effect upon the market. The very best qualities, however, continue to hang at collieries; and a great many of the pits are not putting in more than four days per week. Medium and common sorts of house coal are moving off moderately; collieries being just about able to dispose of what they are raising. Prices remain practically stationary. There are perhaps fewer of the cheap special clearance lots coming on the market at low-cut figures; but the quoted rates are only about maintained. At the pit, best Wigan Arley does not average more than 13s. 6d. to 14s. and 14s. 6d. per ton, seconds Arley and Pemberton four-feet from 11s. and 11s. 6d. up to 12s. 6d.,

THE
MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas
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with common house coal to be bought readily at 9s. 6d. to 10s. 6d. The lower descriptions of round coal, used for steam, forge, and general manufacturing purposes, met with only an indifferent inquiry. Consumers do not care about contracting forward, and prefer in many cases to go on covering current requirements with cheap lots that can be picked up on the market. At the pit, 7s. 9d. to 8s. 3d. per ton still represent about the average for ordinary quantities of steam and forge coals; anything above this being only obtained for some special sorts. There is a tendency to harden in the better qualities of engine fuel; but not more than about 5s. 9d. and 6s. 3d. up to 6s. 6d. per ton is being secured at the pit. Other descriptions of slack continue plentiful on the market; and for these prices remain low. Common slacks average 4s. to 4s. 6d. per ton, and medium sorts 4s. 9d. to 5s. 6d. For shipment, low-cut quotations continue to be made to effect clearances of common coal; and special lots are put through at about 8s. 9d. to 9s. per ton, with ordinary qualities quoted about 9s. 3d. to 9s. 9d., delivered at the ports on the Mersey.

Northern Coal Trade.

There is rather more demand for certain classes of coal; but it is very irregular, which influences the prices to some extent. In the steam coal trade, best Northumbrians are now more plentiful, and may be quoted as from 9s. 7½d. to 9s. 9d. per ton f.o.b. Second-class steams are about 8s. 6d., and steam smalls 4s. 6d. to 4s. 9d. Production is fairly good, and is on the whole well taken up; but some of the collieries have occasionally an idle day. In the gas coal trade, best descriptions vary from 8s. 6d. to 8s. 9d. per ton f.o.b.; while second qualities are from 8s. to 8s. 4½d., with a moderate demand. Some sales of gas coal are reported for next season at a slight reduction in price; but, so far as is known, none of any very large amount are included. As gas coke is now much more plentiful, its price is easier, and varies more. About 14s. 6d. per ton may perhaps be the f.o.b. quotation for good gas coke, on Tyneside.

Scotch Coal Trade.

The trade remains unchanged, either as to volume or price. In fact, there is nothing new to record. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 9d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 245,665 tons—an increase of 31,110 tons upon the previous week, but a decrease of 11,776 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,837,694 tons—an increase of 151,734 tons upon the same period of last year.

The Meldreth and Melbourn District Gas and Water Company, Limited, has been registered with a capital of £16,000, in £5 shares, to supply water and to manufacture and supply gas in the parishes of Meldreth, Melbourn, and Shepworth, in Cambridgeshire, and adjoining parishes. The minimum cash subscription is 100 shares.

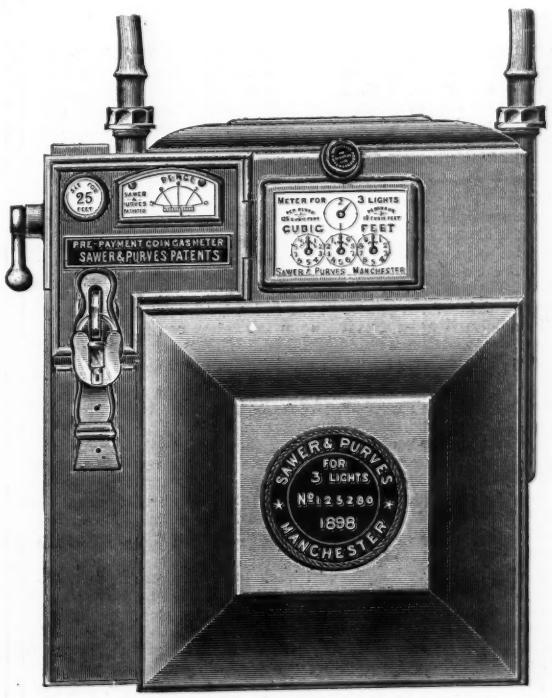
Oil Gas Enrichment Company.—The annual report of the Directors of the Oil Gas Enrichment Company, Limited, states that during the past year the affairs of the Company have progressed satisfactorily. The royalties received show an increase of £50 10s. 4d. over the preceding year. Out of the balance at the credit of the profit and loss account, a dividend is recommended at the rate of 5 per cent, carrying forward a balance of £431.

Lostwithiel in Darkness.—Lostwithiel, which was in darkness a few weeks ago owing to the flooding of the gas-works, had another unpleasant experience last Tuesday, when the lights failed owing to a mishap to the gasholder. A good deal of inconvenience was caused, particularly at the railway station; while a meeting of the Town Council which was in progress had to be conducted by candlelight. The defect was remedied as promptly as possible, and the supply was resumed on the following night.

A Record Year at Matlock Bath.—Great satisfaction was expressed by the members with the character of the annual statement submitted by the Gas Manager (Mr. W. Jaffrey) at the last monthly meeting of the Matlock Bath Urban District Council. This showed that the profit on revenue account for the twelve months ending March 31 was £1063, which is the highest figure yet reached. The quantity of gas made was 18,490,400 cubic feet; the make per ton having been 11,192 feet. The unaccounted-for gas amounted to 6·78 per cent., as compared with 16·55 per cent. in 1895. The number of consumers in 1896, under the old Company, was 372; while in the past year it had increased to 569. The total income for the year to March last was £3699; and the expenditure, £2636. The Chairman (Mr. J. E. Lawton, J.P.) said it must be a pleasure to Mr. Jaffrey to have gradually brought the works up to this state of perfection. The Council might congratulate themselves on having taken over the undertaking when they did.

Accident to a Retort-House Roof at Leeds.—An accident (which, however, was not attended with any very serious consequences) occurred about mid-day last Tuesday at the New Wortley Gas-Works, Leeds, to the roof of the new inclined retort-house. The roof was let by contract, and at the time of the mishap the contractor's men were engaged in erecting the principals on the building, which is 296 feet long, 70 feet wide, and 55 feet high. Eight of these principals were in position, and were held together by purlins. The first principal, near the gable end of the house, was held by means of one 1-inch and four ¾-inch ropes, which were fastened to the principal rafter, and led over and through the gable-wall, and securely fixed. There were also wooden stays lashed to this principal, to prevent it and the others falling toward the gable-wall. The wind, which was blowing strongly at the time, however, caused the principals to sway; and the ropes were sawn in two by coming in contact with the stonework of the building. Consequently the eight principals fell to the ground, away from the gable-wall. The last principal evidently struck the derrick, and rebounded on to three others, causing the four to be badly twisted. The other principals were, fortunately, not much damaged. Altogether the mishap might have been much worse.

THE ABOVE REPRESENTS THE SIZE OF OUR BUSINESS WHEN THE "POSITIVE" SLOT METER WAS FIRST MADE IN 1889.



SAWER & PURVES,

MANCHESTER
AND
NOTTINGHAM.

IT HAS INCREASED IN RATIO TO THE ABOVE, SINCE THE POPULARITY AND PRE-EMINENCE OF THE "POSITIVE" SLOT METER BECAME PRONOUNCED.

Incandescent Lighting at Hammersmith.—At the meeting of the Hammersmith Borough Council on Wednesday, it was reported that, with the exception of 69, the whole of the public lamps in the district had been fitted with incandescent burners. In view of the satisfactory results obtained, it was resolved that the remainder should be fitted in the same way as the others.

Loughborough in Darkness.—Some inconvenience was caused at Loughborough on Monday of last week by a workman turning the gas off from one holder and neglecting to open the valve of the other. Mr. E. Onions, the Gas Manager, was soon at the works, and with a number of the staff righted the difficulty. In the highest part of the town the street-lamps remained lighted; but some of the tradesmen and the Post Office officials were not so fortunate in their experience.

Tees Valley Water Board.—At the annual meeting of the Tees Valley Water Board last week, Alderman Hugh Bell was unanimously re-elected Chairman for the twenty-eighth time. The half-yearly report of the Board to the Corporations of Stockton, Middlesbrough, and Thornaby showed the capital expenditure for that period to have been £72,238, bringing up the total cost of the undertaking to £2,229,172. During the half year, £73,346 was received on capital account; the total amount received to date being £2,225,784, or £3387 less than the sum expended. The revenue account showed the income to have been £48,393; being a decrease of £250 as compared with the preceding half year, and an increase of £818 as compared with the six months ending Aug. 13, 1902. The expenditure on revenue account during the half year amounted to £9391. The balance carried to net revenue account was £39,001.

We have received from Messrs. Pond and Co., of Farringdon Street, who, as mentioned in the "JOURNAL" last week, are introducing the "Wis" high-power incandescent gas-lamp for indoor and outdoor lighting described and illustrated in that issue, a list of their gas-fittings, comprising plain and ornamental brackets and suspensions for ordinary or incandescent burners. Some of the patterns are of highly ornate design; and they are effectively shown off by the excellence of the printing.

In connection with the Plymouth, Devonport, and Stonehouse Trades, Industrial, and Photographic Exhibition, which was opened in the Drill Hall, Plymouth, on the 4th inst., and has been largely attended, we notice that gold medal diplomas have been awarded to the Richmond Gas Stove and Meter Company, Limited, for gas cookers and fires; to Messrs. W. Sugg and Co., Limited, for high-pressure burners and anti-vibrators; and to Messrs. Willey and Co., Limited, for gas meters and fittings.

The Board of Trade having threatened the Acton Urban District Council that, unless some headway is made in their scheme of electric lighting, in respect to which a Provisional Order was granted twelve years ago, it will be withdrawn at the end of the present year, the Council have appointed Mr. W. H. Trentham their Electrical Engineer for three years, and have referred to him the desirability of having a combined scheme of electric lighting and dust destructor works. The expenditure involved is estimated to exceed £100,000.

The James Keith and Blackman Company, Limited, have received an order to fix a 2000-candle power Keith light over the convenience in South Place, E.C., in all particulars similar to the lamp over the women's convenience in Farringdon Road, which was described in the "JOURNAL" at the end of last year, and which has evidently given the lighting authorities entire satisfaction. The information is interesting in connection with the decision of the Corporation (referred to last week) to largely extend the use of the incandescent gas-burner.

The amount which the Skipton Urban Council are proposing to spend on their Embsay Moor water scheme is considered by many of the ratepayers to be a serious matter; and a number of them have requisitioned the Council to call a public meeting upon the question before depositing their Bill, or, if unable to do this, to allow the free use of the Town Hall for a meeting to be called by the ratepayers themselves. The Council have decided upon the latter course, as they do not see their way to call a meeting just now. The statutory meeting of ratepayers will, however, any way be held in January.

Messrs. A. E. Podmore and Co., of No. 25A, Hatton Garden, have issued a new catalogue illustrating some charming designs in fittings for ordinary and inverted incandescent gas-burners. The pendants for two and three lights are very elegant; and they are supplied in bronze or polished brass. The glassware, too, is extremely tasteful, and of refined appearance. Fittings, with hammered ornamental scroll work, seem to be of the style for which there is the greatest present demand; and there is a good variety of patterns in these. The remarks referring to the pendants may also be applied to the various brackets shown in the catalogue.

From Monday to Wednesday last week an exhibition of gas cooking stoves and appliances, as well as the latest designs in ornamental gas-fittings, was held in the Princes Risborough Institute, under the auspices of the Davis Gas-Stove Company, Limited, and the Princes Risborough Gas Company. The lighting of the building was greatly admired; a special feature being the "Volonta" pendant, described in the "JOURNAL" last week. Inverted incandescent lamps, a great variety of self-lighting and extinguishing burners, and fittings of the Welsbach Company, made an effective display. The exhibition was opened by Mr. George Lane, the Engineer of the Aylesbury Gas Company, who, in a few well-chosen remarks, showed how gas was by far the cheapest and best light in the market. He also spoke of Princes Risborough, though a small town, as a pattern of public lighting, having adopted incandescent gas some six or seven years ago, while some of the neighbouring towns were still using the old-fashioned flat-flame burners for street lighting. In addition to lighting, the value of gas for culinary purposes was well exemplified by Mrs. Springthorpe. The exhibition was well patronized, and the details carefully carried out by the Manager of the Gas Company, Mr. Arthur Graham Lane.

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"Eureka"

SELF-CONTAINED

HOT-WATER

AND STEAM

Radiators

(*Gas Heated.*)

Require NO WATER or STEAM connection.

EXCEEDINGLY

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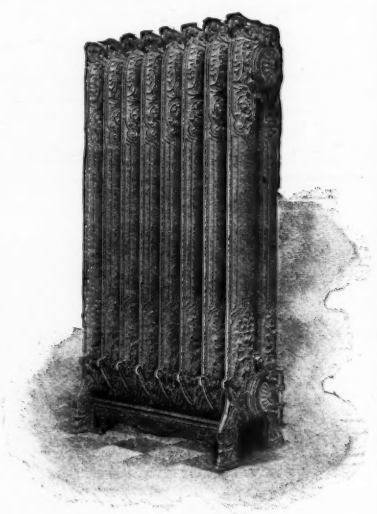

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MADE IN SIX CONVENIENT SIZES.

JOHN WRIGHT & CO., ESSEX WORKS, BIRMINGHAM.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
FOREMAN OF FITTERS, &c. Richmond (Surrey) Gas Company.
MAIN AND SERVICE LAYER. Richmond (Surrey) Gas Company.

Situations Wanted.
PLUMBER AND SERVICE LAYER. No. 4127.
SUPERINTENDENT OF FITTINGS, &c. (South Africa). Williams, Egremont.
WORKING MANAGER. No. 4128.
WORKS MANAGER (Gas Stove Trade). No. 4119.

Agency Wanted.
FIRE-CLAY GOODS, &c. No. 4126.

Agents Wanted.
"GAS-WORKS," c/o Street's, London.

Plant for Sale.
CHEMICAL APPARATUS. Rose, Doncaster.
STATION METER. Shepshed Gas-Works.

Company Meeting.
CHELSEA WATER-WORKS COMPANY. Offices, Dec. 17, One o'clock.

Sales of Stocks and Shares.
BARKING GAS COMPANY. Dec. 8.
CROYDON GAS COMPANY. Dec. 2.
HARROW AND STANMORE GAS COMPANY. Dec. 8.
KENT WATER-WORKS COMPANY. Dec. 15.
MAIDSTONE GAS COMPANY. Nov. 26.
SOUTHEND GAS COMPANY. Dec. 8.

TENDERS FOR

Coke-Elevator.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

Exhauster and Engine.
MANCHESTER GAS DEPARTMENT. Tenders by Dec. 12.

Fire-Clay Goods.
SHIPLEY GAS DEPARTMENT. Tenders by Dec. 15.

Gas-Works (Complete).
STRABANE URBAN DISTRICT COUNCIL. Tenders by Dec. 15.

Ironwork for Roof, &c.
SHIPLEY GAS DEPARTMENT. Tenders by Dec. 15.

Masonry.
SHIPLEY GAS DEPARTMENT. Tenders by Dec. 15.

Meters, &c.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

Oil for Gas Making.
SWINDON UNITED GAS COMPANY. Tenders by Dec. 5.

Pipes and Connections, &c.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Nov. 30.

Portland Cement.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Dec. 14.

Station Meter.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

Steel Rails.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Dec. 14.

Stoves, &c.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

Sulphate of Ammonia Plant.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

Tar and Ammoniacal Liquor.
BIRKENHEAD GAS DEPARTMENT. Tenders by Dec. 3.
SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 9.

Time Register.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Dec. 1.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half-Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 5s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11 Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 35, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

MANTLE ASHES.

THE Highest Price in the Market— 35 Marks per Kilo—for above is paid by Messrs. OBERFELT AND CO., BERLIN, ENGEL UFER 1b., MANUFACTURERS OF MANTLES and Buyers of any quantity of ASHES.

YOUNG Gas Engineer, with Practical Training in Fitting and Meter Shops, and Drawing Office, is proceeding to South Africa in December. Holds First-Class Technical Certificates, and excellent Testimonials. Open to superintend work there or perform other duty.

Address G. SPENCER WILLIAMS, 21, Trafalgar Avenue, Egremont, CHESHIRE.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

PATENTS AND TRADE MARKS

PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SOUTH SHIELDS GAS COMPANY.

THE List of Applications for the Post of ACCOUNTANT and BOOK-KEEPER is NOW CLOSED.

WANTED, a Situation as Working MANAGER of Works making 12 to 30 Millions, by practical married Man. Age 33. Sixteen Years' Experience. Regenerators, Water Gas, Meters, Mains, and Services. Highest Testimonials.

Address No. 4128, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO MAKERS OF FIRE-CLAY GOODS, RETORTS, &c.

ADVERTISER, who is well-known to the Gas Profession, is in want of a good AGENCY for above, for North Midlands, including Lancashire and Yorkshire. Best of Credentials, many Years' Experience, and Business Guaranteed.

Address No. 4126, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE.

ADVERTISER (Age 36), Twenty Years Experience in the Trade, desires an EGAGEMENT as WORKS MANAGER, or similar post, or would undertake management of Gas Company's Show-Rooms, &c.

Address No. 4119, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Man (Married) seeks Situation as PLUMBER and SERVICE LAYER. Meter Fixing, Stoves, and Slot Installations. North preferred.

Address No. 4127, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AGENTS wanted for a Speciality to be sold to Gas-Works and Chemical-Works. Liberal Commission.

Applications to be addressed, in first instance, to "GAS-WORKS," care of Street's, 30, Cornhill, LONDON.

RICHMOND (SURREY) GAS COMPANY.

WANTED, a Competent and Experienced Man, not over 40 years of age, as FOREMAN of Fitters, Service-Layers, and Outdoor Workmen.

Apply, in own handwriting, stating Experience, present Position, and Wages required, with *copies* of Testimonials, to the Engineer of the above-named Company.

The Company also require a Steady and Competent MAIN and SERVICE LAYER; and Applications, in writing, with References, should be sent as above.

1500 Feet Cowan Station Meter, with 4-inch Connections and Bye-Pass Valves, in Good Working Order, FOR SALE.

SHEPSHED GAS-WORKS, LEICESTERSHIRE.

FOR SALE—A quantity of Chemical APPARATUS, including accurate Bunge Short Beam Balance.

List on application to TOM R. ROSE, Belmont Villa, DONCASTER.

TO BE SOLD — Twin-Cylinder Gas-ENGINE, 6 n.h.p., by Crossley; Cylinders 8 in. diameter by 18 in. stroke, and Gas-Bag.

NEW GASHOLDER SHELLS, 40 feet diameter by 12 feet deep, and 50 feet diameter by 15 feet deep, with or without New Steel Tanks and Standard Guides.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD Cheap:—

Two (18 inch) SQUARE STATION METERS, new drums.

TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.

Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."

EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.

CONDENSERS, RETORT IRONWORK, GASHOLDERS, STEEL TANKS.

Every description of New and Second-Hand Gas Plant made and supplied.

Inquiries solicited by J. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1904, delivered into contractor's tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley siding on the Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is 2500 Tons per annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 7th of December.

SHIPLEY URBAN DISTRICT COUNCIL.

THE Council are prepared to receive TENDERS, from experienced Contractors, for the following:—

CONTRACT No. 4—MASONRY of an Inclined Retort-House.

CONTRACT No. 5—IRONWORK of Roof and Retort-Stack Mountings, Coal Elevating and Charging Plant.

CONTRACT No. 6—FIRE-CLAY WORK and MATERIALS of an Inclined Retort-Stack, Settings, and Chimneys.

The Specification and Drawings may be seen on application to Mr. T. G. Wilcock, Manager, Gas-Works, Shipley, and at the Office of Messrs T. Newbigging and Son, Engineers, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities may be obtained from the latter on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Gas-Works Extension," to be sent to the undersigned not later than Monday, the 15th of December, 1903.

The Council do not bind themselves to accept the lowest or any Tender.

ISAAC LINDOW,
Clerk of the Council.

Manor House, Shipley,
November, 1903.

THE EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS.

TO PIPE FOUNDERS.

THE Gas Commissioners are prepared to receive TENDERS for the supply and delivery of about 650 Tons of 24-inch, 170 Tons 15-inch, and 355 Tons 12-inch Diameter Cast-Iron Spigot and Faucet MAIN PIPES, in 12 feet lengths, along with CONNECTIONS and SPECIALS.

Contractors may also quote for Pipes to their own pattern, but not exceeding the specified weight.

Deliveries to be in regular weekly quantities or as required, commencing at the end of April and continuing up to the end of September, 1904.

The Pipes and Connections are to be delivered free in waggons on the North British or Caledonian Railway Systems, or free on rail at Leith or Granton Harbours.

Specifications, Schedules, and Forms of Tender can be obtained upon application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.

Tenders to be lodged with the undersigned on or before Monday, the 30th day of November, 1903, not later than Ten a.m., endorsed "Tender for Main Pipes."

The Commissioners do not bind themselves to accept the lowest or any offer, and reserve to themselves the right of accepting the whole or any portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh.
Nov. 11, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TO RAILWAY RAIL CONTRACTORS.

THE Commissioners are prepared to receive TENDERS for the supply of from 250 to 300 Tons of New Double-Headed STEEL RAILS, weighing 75 lbs. per lineal yard, in lengths of from 24 to 30 feet, delivered at their Railway Sidings, New Gas-Works, Granton, near Edinburgh (Caledonian or North British Railway Systems), or free on rail at Leith or Granton Harbours.

Deliveries to be commenced immediately after acceptance of Offer, and to extend over a period of Three Months.

Full Particulars and Section of Rail can be obtained upon application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.

Tenders to be lodged with the Undersigned on or before Monday, the 14th day of December, 1903, not later than Ten a.m., sealed and endorsed "Tender for Railway Rails."

The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or a portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Nov. 16, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive TENDERS for the supply of 4000 to 5000 Tons of Best Quality Fine Ground Medium Quick-Setting PORTLAND CEMENT, delivered in Bags *ex.* ship into Railway Waggons, Granton Harbour, or on rail at the Sidings, New Gas-Works, Granton, near Edinburgh (Caledonian or North British Railway Systems.)

Deliveries to commence in the beginning of 1904 and extend over a period of about Three Years in quantities of from 200 to 300 Tons.

Full Particulars can be obtained on application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.

Tenders to be lodged with the undersigned on or before Monday, the 14th day of December, 1903, not later than Ten a.m., sealed and endorsed "Tender for Portland Cement."

The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or a portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Nov. 16, 1903.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Corporation of Birkenhead invite OFFERS for the Purchase and Removal of the AMMONIACAL LIQUOR produced at the Gas-Works, for a period of One, Three, or Five Years from the 1st of July, 1904.

Deliveries to be taken either by Boat or Rail to the mutual convenience of the Corporation and the Contractor; but the latter will be required to provide Boats or Railway Tank-Waggons—the Corporation providing appliances for filling same.

The Contractor whose Tender is accepted will be required to enter into a formal Contract or Agreement with the Corporation, upon the specific terms and conditions contained in the draft contract which has been prepared by the Town Clerk, and deposited in his Office for inspection, and containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the contract is to be performed.

Forms of Tender, and further Particulars, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, at the Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Ammoniacal Liquor," to be sent in to me not later than Five p.m. on Thursday, the 3rd of December, 1903.

The Corporation do not bind themselves to accept the highest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Nov. 20, 1903.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works during the Year 1904. Quantity, about 70,000 Gallons.

The Contractor to find his own Casks and to accept delivery at Blackhill Station.

Tenders to be sent not later than Wednesday Dec. 9.

M. RICHLEY,
Secretary.

Shotley Bridge, Nov. 21, 1903.

GAS OIL.

THE Directors of the Swindon United Gas Company are prepared to receive TENDERS for the supply of about 300,000 Gallons of OIL suitable for the Manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such quantities and at such times as may be required during the two Years commencing Jan. 1, 1904.

Sealed Tenders, endorsed "Tender for Oil," to be sent in to the undersigned on or before Saturday, Dec. 5, 1903.

The lowest or any Tender not necessarily accepted.

JOHN J. JERVIS,
Secretary.

Gas Offices, Queen Street,
Swindon, Nov. 20, 1903.

ASHFORD (KENT) URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Lighting Committee are prepared to receive TENDERS for the supply and erection complete of a 20,000 Cubic Feet per hour STATION METER, with 12-inch Connections, Valves, and needed Fittings; a complete SULPHATE of AMMONIA PLANT capable of making 10 Tons of Sulphate per week; a COKE-ELEVATOR; a TIME REGISTER; and for the supply only of METERS, STOVES, and other Fittings required during the ensuing Two Years.

Sealed Tenders are to be delivered at the Gas-Works, Ashford (Kent), on or before Tuesday, Dec. 1, 1903, addressed to the undersigned.

G. HARPER,
Chairman, Gas Committee.

Ashford, Nov. 16, 1903.

TENDERS WANTED FOR THE ERECTION OF NEW GAS-WORKS.

TO BUILDERS, CONTRACTORS FOR GAS-WORKS, AND OTHERS.

TENDERS are invited by the Urban District Council of Strabane for the erection of a GAS-WORKS in accordance with Specifications, Schedules, and Drawings, which may be seen either here or at the Offices of Mr. Charles Hunt, M.Inst.C.E., 15, Victoria Street, Westminster, S.W., from whom also Copies may be obtained on payment of Three Guineas, to defray the cost of same.

Sealed Tenders, which may be for the whole or any part as divided in the Specifications, endorsed "Tender for Gas-Works," and addressed to The Chairman, Urban District Council, Town Hall, Strabane, to be sent in not later than Tuesday, the 15th day of December next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
T. B. FEELY,
Town Clerk.

Offices: Town Hall, Strabane,
Nov. 7, 1903.

KENT WATER-WORKS COMPANY.

SALE BY TENDER OF THREE PER CENT. DEBENTURE STOCK.

THE Directors invite Tenders for such amount of THREE PER CENT. DEBENTURE STOCK, or of any portion thereof, being a multiple of £10, as may in the whole be sufficient to realize the sum of £74,147 6s. 7d., being the balance of the Capital authorized to be raised under the provisions of the Kent Water-Works Act, 1902.

This Stock may be redeemed at par by the Company at any time after the expiration of 25 Years from the date of issue upon Six Months previous notice to the registered holders thereof. It ranks *pari passu* with the other Debenture Stocks of the Company for the payment of interest.

The Ordinary Capital of the Company raised is £868,000, which comprises £708,000 Capital Stock, on which a dividend of 10 per cent. per annum was paid on the Half Year to Midsummer, 1903, and £160,000 new Capital Stock, on which the full dividend of 7 per cent. has been paid since its issue.

The Loan Capital raised is £273,512—viz., £42,000 by Mortgages, and £231,512 by Debenture Stock.

This Stock is an authorized investment for Trustees.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary.

Tenders to be sent in on or before Tuesday, the 15th of December.

By order of the Directors,
A. DICKSON, jun.,
Secretary of the Company.

Kent Water-Works Offices:
Mill Lane, Deptford, S.E., Nov. 14, 1903.

CHELSEA WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the Half-YEARLY GENERAL MEETING of the Governor and Company of Chelsea Water-Works will be held at their Office, Commercial Road, Pimlico, in the County of London, on Thursday, the 17th day of December prox., at One o'clock in the afternoon precisely, for the General Business of the Company.

The REGISTER OF TRANSFERS WILL BE CLOSED between the 5th day of December prox. and the 17th day of December prox., both days inclusive.

By order,
G. H. GILL,
Secretary.

London, Nov. 21, 1903.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

TO EXHAUSTER AND ENGINE MAKERS.

THE Gas Committee are prepared to receive TENDERS for the work required to be done in the Supply, Delivery, and Erection of Three Twin Sets of EXHAUSTERS and ENGINES at their Rochdale Road Station.

Specification, Drawing, and Tender Form may be had on application (in writing only) to Mr. C. Nickson, Superintendent, Gas Department, Town Hall. Any other Information required may be obtained on application to Mr. J. G. Newbigging, C.E., at his Office, Rochdale Road Station.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Exhausters and Engines," must be delivered at the Gas Offices, Town Hall, not later than Ten a.m. on Saturday, Dec. 12, 1903.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Nov. 16, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £4570 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BARKING GAS COMPANY.

72 £10 ORDINARY 7 PER CENT. SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TO CAPITALISTS AND INVESTORS.

NEW ISSUE OF STOCK
IN THE
MAIDSTONE GAS COMPANY.

MESSRS. TOOTELL AND SONS are favoured with Instructions from the Directors to SELL BY PUBLIC AUCTION, at the Royal Star Hotel, Maidstone, on Thursday, Nov. 26, 1903, at Three o'clock, in Lots to suit Large and Small Investors,

£5000 CAPITAL STOCK and £2500 THREE PER CENT. DEBENTURE STOCK
IN THE
MAIDSTONE GAS COMPANY,
Issued under the Maidstone Gas Act, 1903.

Particulars and Conditions of Sale may be obtained of Messrs. HOAR, HOWLETT, AND TATHAM, Solicitors, 9, King Street, MAIDSTONE; or of Messrs. TOOTELL AND SONS, Auctioneers and Valuers, 13, King Street, MAIDSTONE.

4 pp. 8vo. Leaflet. Price, 10s. 6d. per 100.

"Agricultural Value of Gas Lime."

A Paper read by Mr. CHARLES D. PHILLIPS, J.P., a Director of the Newport Gas Company, before the Monmouthshire Chamber of Agriculture.

Reprinted from the "JOURNAL" for Oct. 13, 1903.

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE BY TENDER OF £5000 CONSOLIDATED "C" ORDINARY STOCK.

MINIMUM PRICE OF ISSUE, £180 PER £100 OF THE STOCK.

THE Directors invite Tenders, at or before 10 a.m. on Wednesday, the 2nd of December, 1903, for the above.

The Dividend on the Stock is payable half yearly, in February and August of each year.

The Dividends for the 18 half years to December, 1902, were at the rate of 9 per cent. per annum, the last nine being paid free of Income-Tax; and for the half year ended June, 1903, at the rate of 9½ per cent. per annum, less Income-Tax.

The net profit earned during the year ended the 30th of June, 1903 (after deducting all charges, including £1560 8s. 4d. interest on Loan Capital) amounted to	£34,458	14	2
This profit was arrived at after carrying to Reserve Fund the sum of	1,500	0	0
And during the same year the Interest on Investments (carried to the credit of the Reserve and Insurance Funds) amounted to	1,091	9	4
	£37,050	3	6

The Reserve and Insurance Funds amounted on the 30th of June, 1903, to £43,639; and the Investments of these Funds (principally in Consols) were valued at £37,894.

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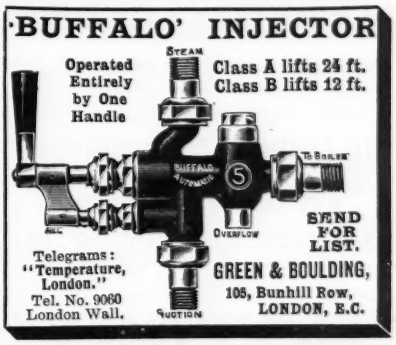

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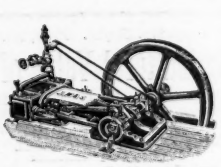

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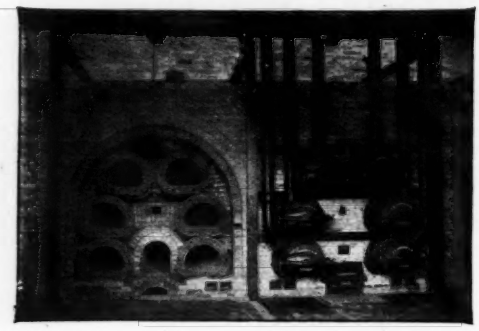

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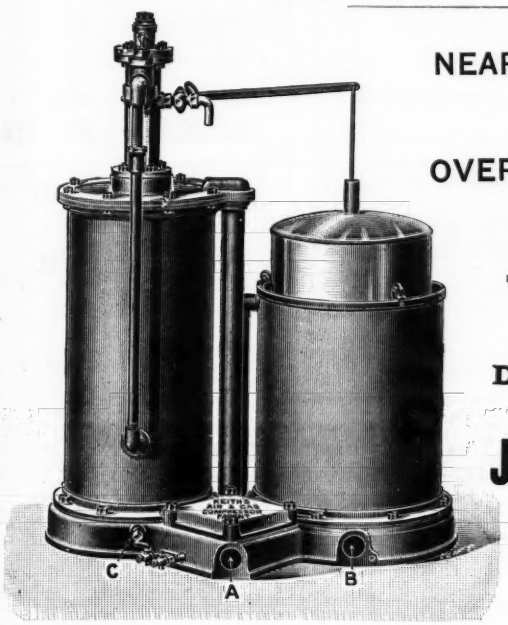

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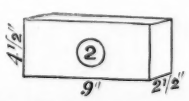

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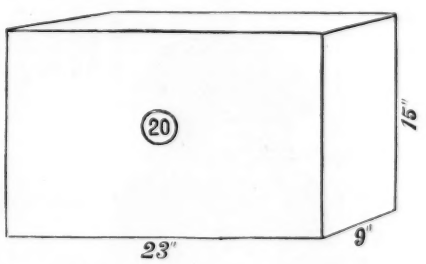

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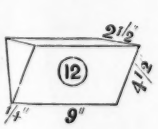

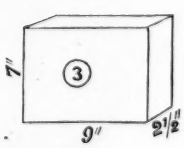

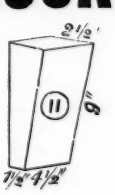

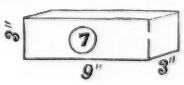

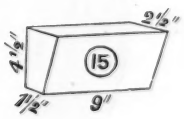

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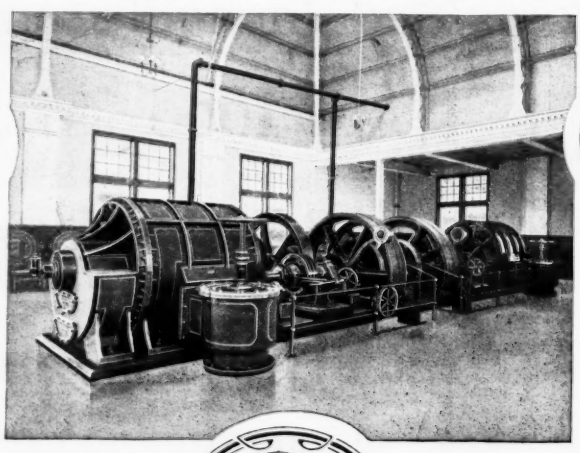

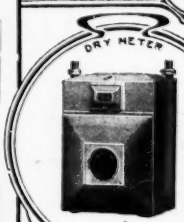

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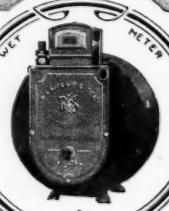

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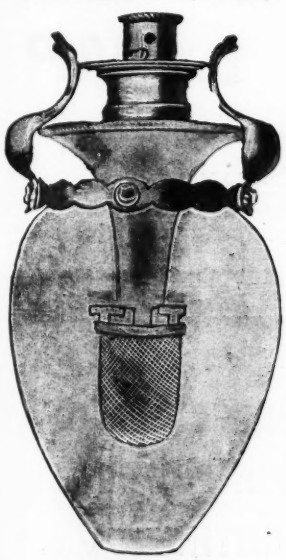

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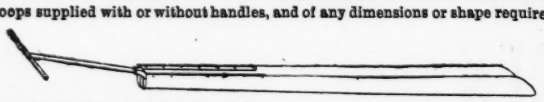

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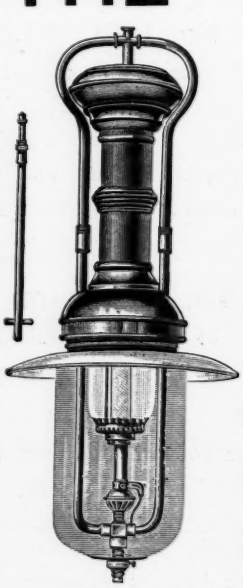
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Name of Gas-Works.	Number of Benches.	Number of Retorts.	Name of Gas-Works.	Number of Benches.	Number of Retorts.
Altona	22	198	Kiel	16	144
Aalborg	6	54	Ludwigshafen	16	144
Barcelona	14	126	Lübeck	4	36
Basel	11	99	Lynn (U.S.A.)	5	45
Berlin II.	14	126	Malaga	6	54
Berlin III.	15	135	Malmoe	12	108
Berlin IV.	24	216	Mariendorf, Berlin, I. C. G. A.	32	288
Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
Berlin, I. C. G. A.	46	414	Mainz (Maintz)	7	63
Bielefeld	8	72	Muelhausen i. Els.	10	90
Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
Brüssel (Brussels)	8	72	Pest (Pesth)	15	135
Cassel	17	153	Pest Mineralölfabrik	1	3
Central Union Gaslight Co., New York	6	54	Posen	6	54
Charlottenburg	32	288	Plauen i. Voigtl	6	54
Chemnitz	27	243	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	20	180	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Düsseldorf	8	72	Strandvej	4	36
Esslingen	3	27	Trieste	18	162
Elberfeld	5	45	Winterthur	8	72
Frederiksberg	27	233	Witten	4	36
Flensburg	6	54	Wittkowitz	4	31
Gera	9	81	Wien (Vienna)	186	1674
Genf	7	63	Zürich	32	288
Göttingen	10	90	Berlin-Tegel	40	360
E. & J. Gutmann, Wien	2	6	Nürnberg	32	288
Haag (The Hague)	9	81	Plymouth	8	72
Haarlem	12	108	St. Gallen	6	54
Hamburg, Billwärder	24	216	Enschede	8	72
Heilbronn	10	90	**Total**	1144	10,263

The Weiss-Zurich and Rothenbach-Bern Patent **Coal-Storage Machinery.** The De Brouwer Patent **Coke Conveyor.** The Drory and Riegel Patent **Charging Apparatus.** The Burgmann Patent **Self-Sealing Expansion Joints** for **Ascension Pipe Sockets. Mouthpieces,** with self-oiling eccentric levers. **Mouthpieces,** with baffle-plates and insulation for reducing the radiation of heat on inclined retorts. **Ascension-Pipe Stopper,** for the prevention of explosions in retort-ovens.

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